WCH-189
Rev. 0

River Corridor
Closure Contract

Groundwater and Leachate Monitoring and Sampling at ERDF, CY 2006

May 2007

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

TRADEMARK DISCLAIMER

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

This report has been reproduced from the best available copy.
Available in paper copy and microfiche.

Available for a processing fee to U.S. Department of Energy and its contractors from:
U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
(865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov
online ordering: http://www.doe.gov/bridge

Available for sale to the public, in paper, from:
U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(800) 553-6847
fax: (703) 605.6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/ordering.htm

Printed in the United States of America

DISCLM-5.CHP (11/99)

DOCUMENT CONTROL 5/30/07 DDS

WCH-189
Rev. 0
OU: NA
TSD: NA
ERA: NA

STANDARD APPROVAL PAGE

Title: Groundwater and Leachate Monitoring and Sampling at ERDF, CY 2006

Author Name: R.L. Weiss

Approval: J.E. Rugg, Waste Services Manager

Karl S Hadley KA HADLEY, EDL
Signature

5/29/07
Date

The approval signatures on this page indicate that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

WCH-189
Rev. 0

River Corridor Closure Contract

Groundwater and Leachate Monitoring and Sampling at ERDF, CY 2006

May 2007

Author:
R.L. Weiss

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

TABLE OF CONTENTS

Table of Contents

APPENDICES

FIGURES

TABLES

ACRONYMS

COC	contaminant of concern
CY	calendar year
DOW	description of work
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
GPP	groundwater protection plan
RCRA	*Resource Conservation and Recovery Act of 1976*
ROD	Record of Decision

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

1.0 INTRODUCTION

The Environmental Restoration Disposal Facility (ERDF) is a Hanford Site low-level mixed waste disposal facility that was brought into service on July 1, 1996. Baseline sampling and analytical data obtained from monitoring wells and the ERDF leachate collection system were used to determine contaminants of concern (COCs) and background conditions for long-term monitoring as described in the *Groundwater Protection Plan for the Environmental Restoration Disposal Facility* (ERDF GPP) (BHI 1996) and to meet the requirements of the ERDF Record of Decision (ROD) (EPA 1995). Ongoing groundwater and leachate monitoring are performed to meet the requirements of the ERDF ROD, and details of the monitoring program are described in the *Description of Work for Routine Groundwater Sampling at the Environmental Restoration Disposal Facility* (ERDF DOW) (BHI 2005a) and the ERDF Amended ROD (EPA 1999, EPA 2003).

1.1 PURPOSE AND OBJECTIVES

The purpose of this annual monitoring report is to evaluate the conditions of and identify trends for groundwater beneath the ERDF and to report leachate results in fulfillment of the requirements specified in the ERDF ROD (EPA 1995).

The objectives of this report are as follows:

- Review routine groundwater sampling data to statistically evaluate if there have been changes in COC concentrations over time that may be attributed to ERDF operations
- Assess conditions that may indicate the presence of encroaching groundwater contaminant plumes originating from upgradient sources in the 200 West Area
- Assess data from routine ERDF leachate sampling to determine if additional constituents should be added to the ERDF groundwater monitoring COC list
- Evaluate the groundwater levels in the ERDF monitoring wells to determine if the existing wells need to be modified or replaced.

Appendix A shows analytical results for groundwater samples that were collected from the ERDF monitoring well network from calendar year (CY) 1996 through CY 2006. Appendix B graphically shows trends in the monitoring data resulting from routine groundwater sampling in the ERDF well network. The most recent 3 years of leachate analytical results for samples collected from CY 2004 through CY 2006 are presented in Appendix C. Leachate data collected from CY 1996 through CY 2003 are contained in previous ERDF groundwater and leachate monitoring reports (Faurote 2000; BHI 2002, 2003, 2004, 2005b; WCH 2006).

2.0 BACKGROUND

2.1 GENERAL DESCRIPTION

The ERDF site is located between the 200 East and 200 West Areas of the Hanford Site (Figure 2-1). This location was selected for the ERDF over other possible locations, in part because of the depth to groundwater in this area, its location above pre-existing groundwater plumes, the relatively flat topography in this area, and the compatibility of this location with stakeholder recommendations.

The ERDF landfill is authorized under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*. The landfill was designed to meet the *Resource Conservation and Recovery Act of 1976* (RCRA) minimum technology requirements; however, the ERDF is not permitted as a RCRA facility. Wastes disposed at ERDF contain elevated levels of radionuclides and hazardous constituents originating from the 100, 200, and 300 Area waste sites.

2.2 ENVIRONMENTAL RESTORATION DISPOSAL FACILITY

There are currently six waste cells associated with the ERDF site. Initially, cells 1 and 2 were constructed and the placement of waste in these cells has since been completed. Cells 3 and 4 were constructed in 2000. Construction of cells 5 and 6 was completed during CY 2004, and two additional cells are scheduled to begin construction in the late fall of 2007. All six cells are roughly equal in size. Figure 2-2 shows the ERDF as it is currently constructed. Throughout CY 2006, approximately 525,613.5 metric tons of remediation wastes were disposed at the facility.

Figure 2-1. Location of the Environmental Restoration Disposal Facility.

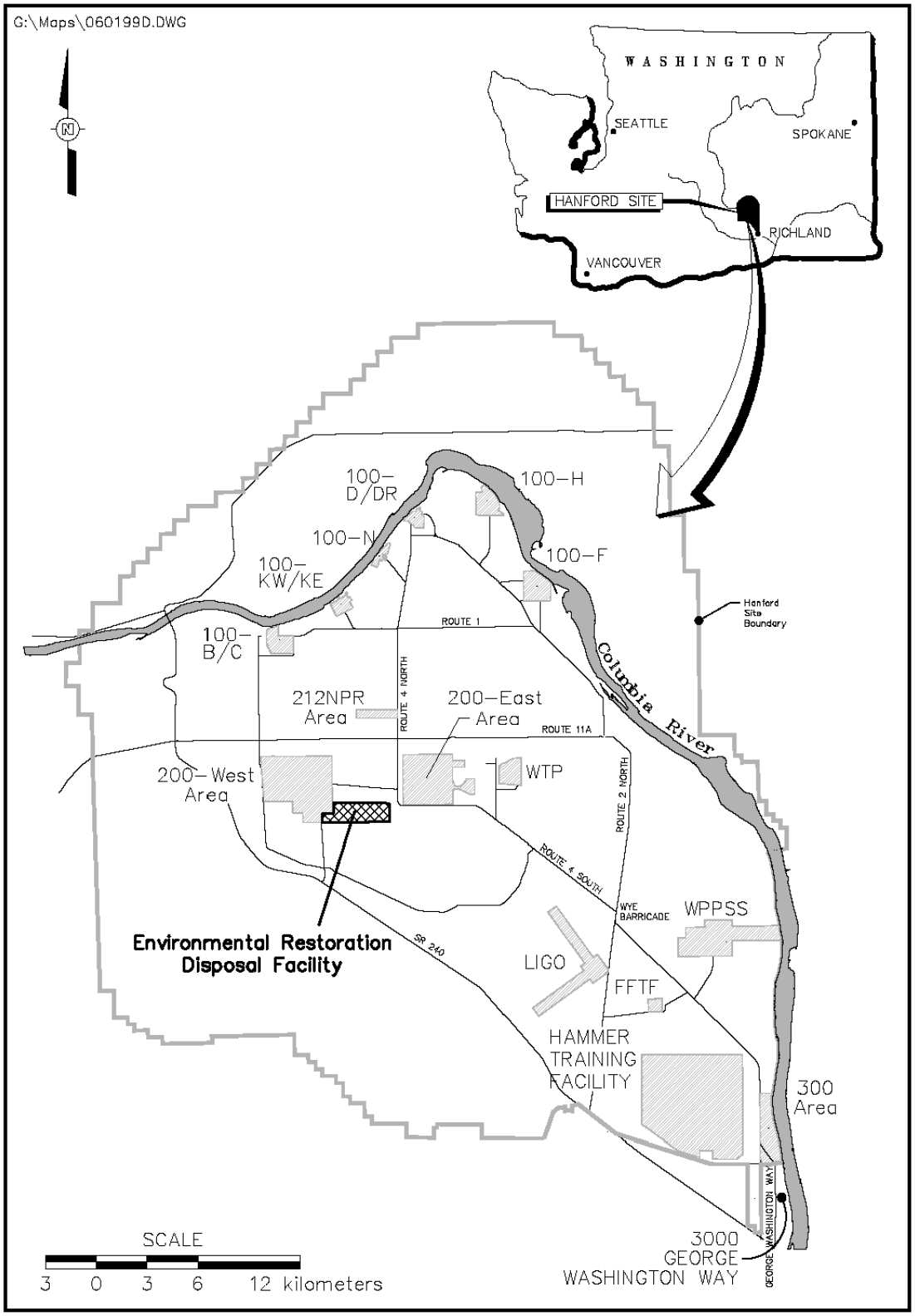
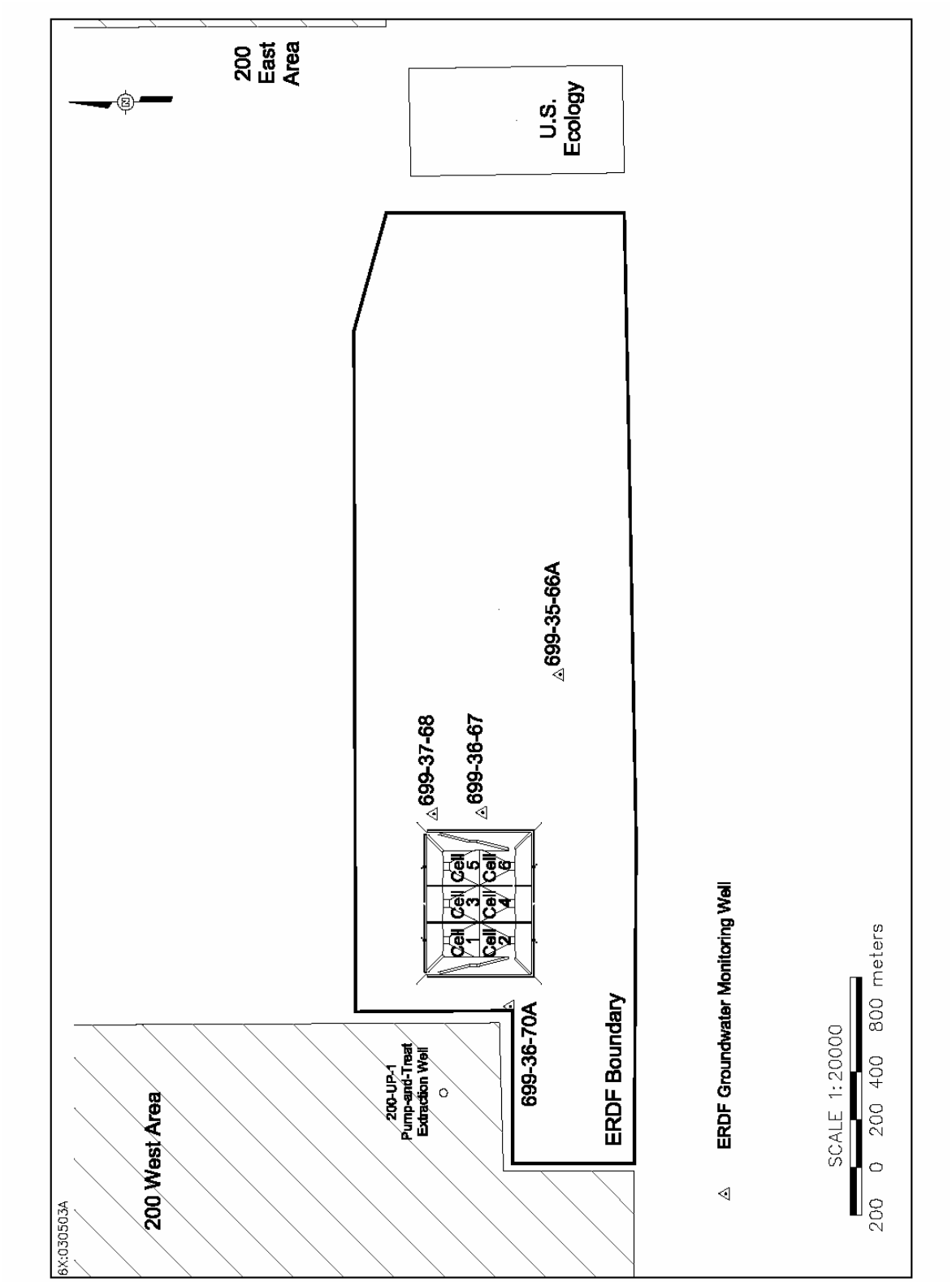


Figure 2-2. ERDF Monitoring Well Location Map.



3.0 GROUNDWATER AND LEACHATE MONITORING

The groundwater and leachate monitoring program is described in the ERDF GPP (BHI 1996). This section provides an overview of these monitoring requirements.

3.1 GROUNDWATER SAMPLING

Groundwater samples are collected semiannually from four monitoring wells in the vicinity of the ERDF. This monitoring well network is scheduled for routine sampling during the first and third quarters of each year. The monitoring well network consists of one upgradient well (699-36-70A) and three downgradient wells (699-35-66A, 699-36-67, and 699-37-68). During CY 2006, groundwater sampling was completed at all of the ERDF monitoring wells in March and September. Well locations are shown in Figure 2-2.

Guidelines for determining COCs for routine groundwater monitoring are described in the ERDF DOW (BHI 2005a). The COCs for routine monitoring were determined based on the results of preoperational baseline sampling conducted in March 1996 and known contaminant plumes beneath the ERDF. Additional COCs may be added to the groundwater monitoring program if analytical results from leachate sampling indicate it is warranted. To date, no additional COCs have been identified for addition to the groundwater lists based on leachate analysis results. Table 3-1 lists the analytes for the groundwater monitoring program. Some alternate analytical methods were employed for the CY 2006 sampling other than those identified in BHI (2005a). The alternate methods achieved all analytical criteria (e.g., detection limits, precision and accuracy criteria) specified and significantly streamlined the analytical process at the laboratory.

Routine groundwater sampling has been conducted since ERDF operations commenced. Sampling at the ERDF groundwater wells was not completed during March 2000 due to a Hanford Site moratorium on groundwater sampling, and well 699-37-68 was not sampled during September 2000 because of problems with a dedicated monitoring well pump (BHI 2004).

Table 3-1. List of Groundwater Analytes by Analytical Method.

Analyte	Method[a]	Practical Quantitation Limit	Accuracy[b] (%)	Precision[b] (%)
Arsenic	6010A	10 μg/L	±25	±25
Barium	6010A	20 μg/L	±25	±25
Chromium	6010A	70 μg/L	±25	±25
Lead	6010A	40 μg/L	±25	±25
Selenium	6010A	750 μg/L	±25	±25
Tin	6010A	30 μg/L	±25	±25
Vanadium	6010A	80 μg/L	±25	±25
Zinc	6010A	20 μg/L	±25	±25
Carbon tetrachloride	8260B	5 μg/L	±25	±25
Alkalinity	310.1[c]	10,000 μg/L	±20	±25
Chloride	300[d]	10,000 μg/L	±20	±25
Fluoride	300[d]	100 μg/L	±20	±25
Nitrogen (in nitrite/nitrate)	353.1	0.05 μg/L	±20	±25
Sulfate	300[d]	2,000 μg/L	±20	±25
Total dissolved solids	160.1[c]	10,000 μg/L	±20	NA
Total organic halides	9020	5 μg/L	±20	NA
Carbon-14	[e]	200 pCi/L	±20	±25
Iodine-129	[e]	5 pCi/L	±20	±25
Technetium-99	[e]	10 pCi/L	±20	±25
Radium	903.1[f]	1 pCi/L	±20	±25
Total uranium	[e]	0.1 μg/L	±20	±25
Gross alpha	900.0[f]	3 pCi/L	±20	±25
Gross beta	900.0[f]	4 pCi/L	±20	±25
pH	[g]	NA	NA	NA
Specific conductance	[g]	25 μS/cm	±20	NA
Turbidity	180.1[c]	0.05 NTU	±0.05 NTU	NA

[a] Method number indicated is from *Test Method for Evaluating Solid Wastes: Physical Chemical Methods* (SW-846) (EPA 1986), unless otherwise specified.
[b] Accuracy is expressed as percent recovery; precision is expressed as a percent relative difference.
[c] Method specified is from *Methods for Chemical Analysis of Water and Wastes* (Kopp and McKee 1983).
[d] Method specified is from *Determination of Inorganic Anions in Aqueous and Solids Samples by Ion Chromatography* (Lindahl 1984), and is a modification of EPA Method 300.0.
[e] Industry standard method, laboratory-specific, based on acceptance by Washington Closure Hanford.
[f] Method specified is from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980).
[g] Parameter will be measured in the field.

NA = not available, or not applicable
NTU = nephelometric turbidity units

3.1.1 General Approach to Evaluating Results

Groundwater samples collected from the ERDF monitoring well network were analyzed in accordance with the requirements of U.S. Environmental Protection Agency SW-846 (EPA 1986), industry standard, or laboratory-specific test methods as presented in Table 3-1. Laboratory results for these samples were entered into the Hanford Environmental Information System, a Hanford Site database that contains environmental analytical data. Groundwater monitoring data contained in the Hanford Environmental Information System were evaluated to identify the analytical results needed for inclusion in this report. The following data selection and evaluation criteria were applied:

- Quality assurance/quality control data were evaluated for the purpose of identifying potential collection or analytical problems. However, unless a problem with the data was identified during this review, the results of or a discussion regarding the quality assurance/quality control data were not included in this report.

- All data qualifiers were recorded.

- If the relative percent difference between values reported for main and duplicate samples was greater than 20%, the samples were flagged in the data spreadsheet and the data evaluated to determine their applicability.

- Data acceptance based on a less than 20% relative percent difference criterion was relaxed for analytical results reported at or near the method detection limit (e.g., typically within five times the detection limit). This allows for an expected increased analytical error when values are close to the detection limit.

- Only analytical results for metals from filtered groundwater samples were used for metals evaluation.

3.1.2 Statistical Approach to Evaluating Results

The statistical analysis of ERDF groundwater monitoring data is based on the ERDF GPP (BHI 1996) and *Hanford Site Groundwater Monitoring Setting, Sources and Methods* (PNNL 2000). The ERDF GPP requires that background water quality be established from four consecutive groundwater sampling events using one of two methods. The background conditions can be determined using either facility-wide groundwater quality data or historical data from each well in the monitoring network. The first approach (facility-wide) results in a single background value for the site for each constituent to which subsequent groundwater quality data are compared. This is referred to as an interwell comparison (PNNL 2000).

The second approach (historical) results in background water quality data for each well to which the subsequent groundwater quality data are compared. This approach is referred to as an intrawell comparison (PNNL 2000). The interwell approach has been selected and used for the ERDF groundwater monitoring program because this method allows for the consideration of impacts from non-ERDF sources.

For each analyte of interest identified in the ERDF GPP, data from four preoperational sampling events at each of the four ERDF monitoring wells were grouped together into data sets. The average concentration, activity, or other appropriate measure for each analyte was determined,

and the tolerance interval for each analyte was calculated. Two-sided tolerance intervals were developed to allow for the potential concentration decreases that may be due to the offsite migration of contaminant plumes and improvements in groundwater quality over time. Data from the subsequent semiannual monitoring events are compared to background levels and the tolerance intervals. Those constituents observed to have levels outside of the tolerance interval are evaluated to determine whether the deviation may be related to an ERDF or non-ERDF source(s).

Where analytical results report a nondetect, the detection limit value is used in this assessment. If a current measurement exceeds a tolerance interval based on the reported detection limit, it is not considered to be a confirmed exceedance and is discussed qualitatively.

3.1.3 Determination of Tolerance Intervals

The tolerance interval represents a concentration range that contains a specified proportion of the population with a specified probability (PNNL 2000). Both the upper and lower bounds of the interval (two-sided) were calculated. The parametric tolerance interval was determined using the following equation:

$$TI = \overline{X}_b + k * S_b \text{ (two - sided)}$$

where:

k = normal tolerance factor, which depends on the number of background samples (n), coverage (P%), and the confidence level (Y)
x_b = mean of background concentrations
S_b = sample standard deviation
TI = tolerance interval.

Coverage of 95% and a confidence level of 95% were used. Application of this equation assumes that a normal (or lognormal) distribution is a reasonable approximation of the background concentrations.

3.2 LEACHATE SAMPLING

Each of the ERDF cells was constructed with a double-liner system for the purpose of collecting liquids, or leachate, that may travel through the waste materials stored at the disposal site. These liquids are typically generated from natural precipitation and the application of dust control water that percolates downward through the disposed waste materials and collects on the surface of the lining material. The primary or upper liners and the secondary or lower liners each are designed to deliver leachate to sump areas. Sumps for the upper liners are independent from the sumps associated with the lower liners. The upper and lower sumps at each of the cells are routinely evacuated, and the leachate is stored in holding tanks prior to transfer to the Effluent Treatment Facility (ETF).

The leachate is sampled to provide data for leachate delisting analyses and to assess whether additional COCs should be added to the routine ERDF groundwater monitoring program. Separate leachate sampling is also performed to verify that waste acceptance criteria for the

ETF are met prior to the transfer of leachate to that facility. The evaluation and reporting of the ETF sampling data is outside the scope of this report.

A composite sample of leachate media was collected in duplicate from the sumps (cells 1 through 4) associated with the upper landfill liners. The composite samples consist of equal quantities of material taken from each of the four sumps associated with the upper liners.

Initial leachate sampling (through the end of CY 2000) was performed quarterly for an extensive list of analytes as defined by the ERDF Amended ROD (EPA 1999, 2003). This "long list" of analytes is shown in Table C-2 in Appendix C. At the end of the initial baseline sampling, the analyte list was revised (short list), and leachate sampling was reduced to a semiannual basis. The short list of analytes is identified in Table C-1 of Appendix C. Once every 2 years, sampling of the long list of analytes is performed on the leachate as identified in the ERDF Amended ROD (EPA 1999, 2003).

The ERDF project continued routine sampling and analysis of landfill leachate during CY 2006. Composite leachate samples for the short list of analytes were collected during the June event and the long list was collected during the December monitoring event. Data for the current year and from the two prior years of leachate sampling (i.e., CYs 2004 to 2006) are used to identify trends that may indicate if additional laboratory analysis for groundwater samples is warranted.

3.3 GROUNDWATER LEVELS

Water-level measurements were collected from each of the four monitoring wells during the semiannual groundwater sampling events to determine groundwater accessibility during future monitoring events. Water-level measurements are taken during each routine groundwater monitoring event immediately prior to purging the well for sample collection.

During the September 2005 monitoring event the exact water level in monitoring well 699-36-67 could not be determined because the electronic tape measure (e-tape) did not appear to reach the top of the water in the well. The water level measuring device apparently did not sound indicating that water had been reached and appeared to be dry when removed from the well. Based on the length of the e-tape used, the water level in this well was more than 3.5 m (11.5 ft) lower than anticipated. Sampling at this well took place as planned, and the well produced a sufficient amount of water for sample collection. This measurement was treated as an anomaly and not used to evaluate water levels and future accessibility. Subsequent samples have returned to expected levels for this well.

Based on a water table map (Figure 3-1), groundwater in the vicinity of the ERDF generally moves from the west across the site to the east-northeast. The hydraulic gradient is about 0.001 m/m (0.011 ft/ft) (BHI 1995). The groundwater table in and near the 200 West Area has been steadily declining since discharges to the 200 West Area pond and trench systems were discontinued during the mid-1980s.

The current hydrograph for the ERDF monitoring wells presented in Figure 3-2 indicates an annual decline of less than 0.4 m/yr (1.31 ft/yr), which is consistent with the regional hydrologic changes reported for the area (Swanson et al. 1999, Hartman et al. 2005).

Figure 3-1. Water-Level Contour Map.

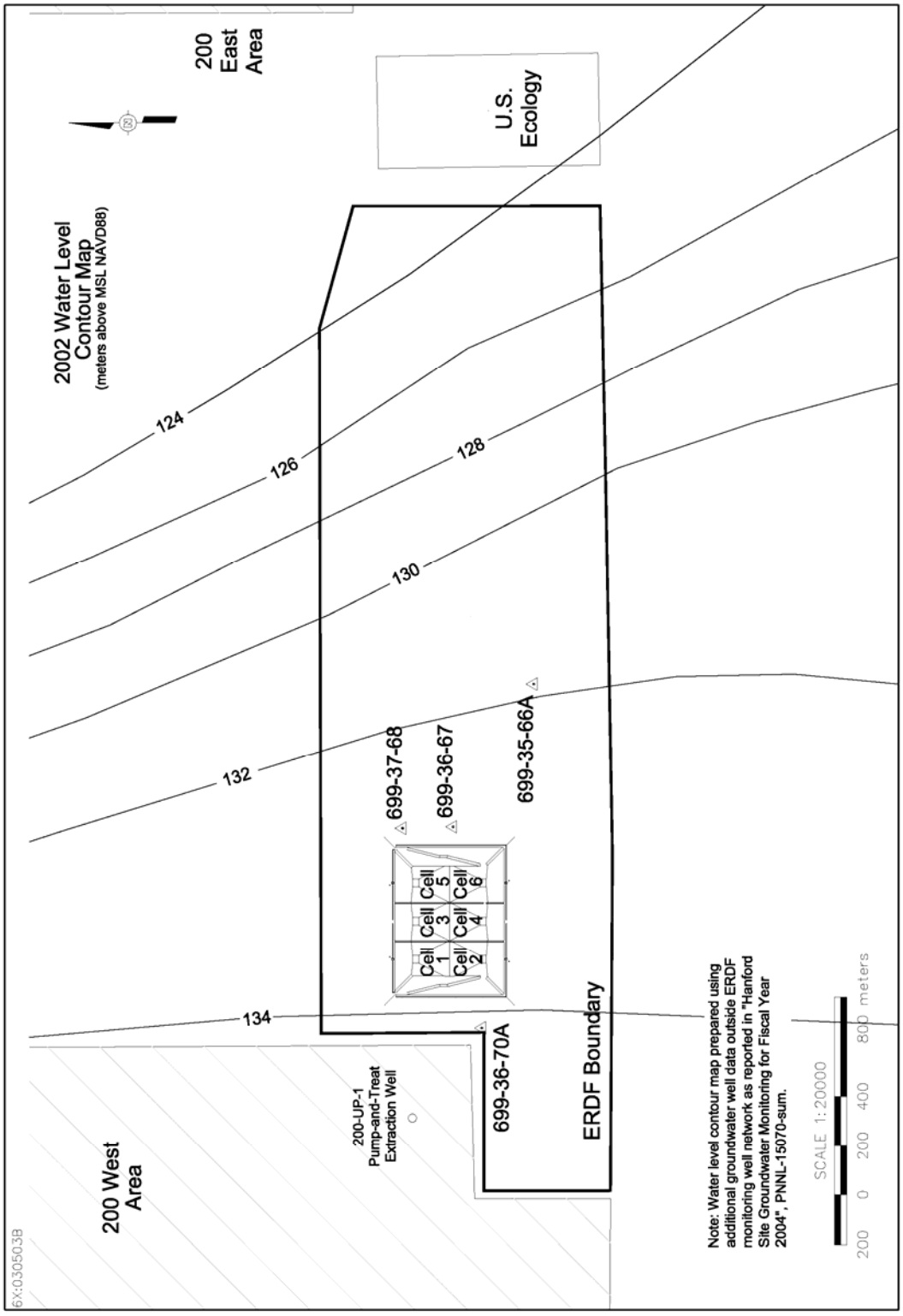
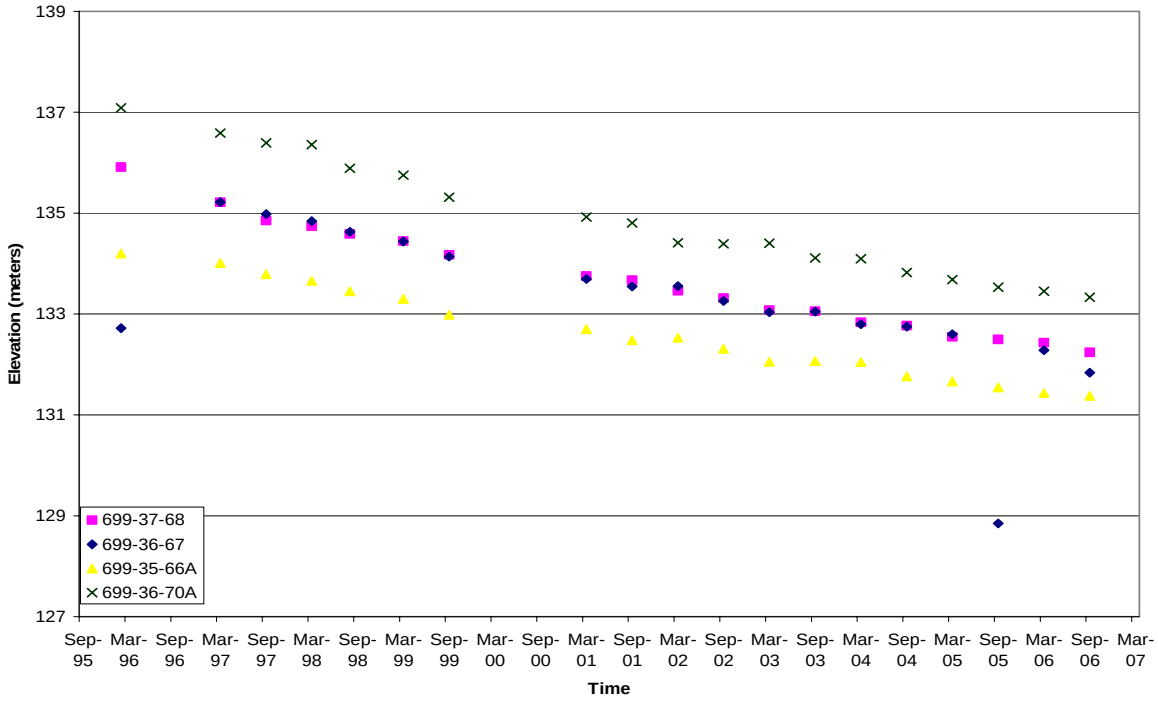


Figure 3-2. Hydrograph from ERDF Groundwater Monitoring Wells.



4.0 ANALYTICAL RESULTS AND FIELD DATA

Analytical results for leachate and groundwater samples collected during CY 2006 are discussed in the following subsections. Also discussed are the data resulting from CY 2006 groundwater-level measurements.

4.1 SUMMARY OF GROUNDWATER ANALYSES

The groundwater results were used to measure analytical and statistical variability. The statistical basis for comparison of the groundwater analysis results is presented in Section 3.1.2 of this report. Analytical results reported for groundwater samples collected from the ERDF monitoring well network are presented in Appendix A, and analyte trend plots summarizing groundwater monitoring results are included in Appendix B.

Groundwater monitoring results and apparent trends based on CY 2006 data are summarized in Table 4-1.

Due to a sample collection error, groundwater was not analyzed from any of the ERDF monitoring wells for the analysis of arsenic, lead, selenium, or tin during the March CY 2006 groundwater monitoring events. When this omission was discovered, since archive materials had already been disposed of, no reanalysis was possible. An attempt was made to obtain data for these analytes from the raw inductively coupled plasma metals data for other metals analysis. Unfortunately, no usable results could be recovered by the laboratory for these metals for this sampling event.

Table 4-1. Summary of Tolerance Interval Comparisons and Trends. (4 Pages)

Analyte	Upper Tolerance Interval	Well(s) Exceeding Upper Tolerance Interval in CY 2006[a]				Comments
		70A	66A	67	68	
Arsenic	4.4 μg/L	Yes	Yes	No	No	No data was recovered for the March 2006 sampling due to a sampling error. Values from the September 2006 sampling indicates that arsenic appears to be trending upward in all wells (including the upgradient well). This appears to be a long term uptrend. It should also be noted that the reported arsenic detects for CY 2006 remained below the Hanford Site background levels for arsenic (7.5 ppb).
Barium	123.3 μg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.
Chromium	16.5 μg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years. Chromium levels in 66A remain elevated relative to the other wells near the upper tolerance limit

Table 4-1. Summary of Tolerance Interval Comparisons and Trends. (4 Pages)

Analyte	Upper Tolerance Interval	Well(s) Exceeding Upper Tolerance Interval in CY 2006[a]				Comments
		70A	66A	67	68	
Lead	70.4 μg/L	No	No	No	No	No data was recovered for the March 2006 sampling due to a sampling error. Values from the September 2006 sampling are below the tolerance interval, consistent with previous analyses and appear very stable. Validation flagged the low-level detect for well 66A as a nondetect due to low-level laboratory contamination.
Selenium	5.6 μg/L	No	No	No	No	No data was recovered for the March 2006 sampling due to a sampling error. The values from the September 2006 sampling are below the tolerance interval, consistent with previous analyses, and appear very stable.
Tin	55.6 μg/L	No	No	No	No	No data was recovered for the March 2006 sampling due to a sampling error. The values from the September 2006 sampling are below the tolerance interval, consistent with previous analyses and appear very stable.
Uranium	3.4 μg/L	No	No	No	No	All wells exhibited stable concentrations below the tolerance interval. This element may be downward trending in most wells.
Vanadium	41.0 μg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.
Zinc	757 μg/L	No	No	No	No	Well 67 continued to exhibit stable but elevated concentrations relative to the other three wells, apparently as a continuing impact of galvanic corrosion to well components in previous years. Validation of CY05 and CY06 data indicates that all low-level zinc detects should be flagged as nondetect due to laboratory contamination.
Alkalinity	151.8 mg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.
Chloride	25.9 mg/L	No	No	No	No	All wells exhibited concentrations below the upper tolerance interval. The lower tolerance interval was exceeded in well 66A for both sampling events and for well 70A for the September 2006 sampling event. These wells appear to be stabilizing at lower chloride concentration levels than originally measured. All other wells appear to be stable with regards to previous years.
Fluoride	0.5 mg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.
Sulfate	37.8 mg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years with an indication of downtrending concentrations in all wells.

Table 4-1. Summary of Tolerance Interval Comparisons and Trends. (4 Pages)

Analyte	Upper Tolerance Interval	Well(s) Exceeding Upper Tolerance Interval in CY 2006[a]				Comments
		70A	66A	67	68	
Gross alpha	3.3 pCi/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years. Note that the majority of the results are nondetected values, which will show greater variability due to associated counting statistics.
Gross beta	31.7 pCi/L	No	Yes	No	Yes	Gross beta concentrations appear to be stabilizing or downtrending at concentrations near to or above the upper tolerance interval. Maximum values in downgradient wells remained below previously determined maximums in the upgradient well. The gross beta activity appears to be associated with a non-ERDF source(s).
Carbon-14	26.8 pCi/L	No	Yes	No	No	Carbon-14 was not detected in any of the wells during the 2006 monitoring events; however, the detection limits exceeded the upper tolerance interval all wells. The analytical detection limits all were less than one-half of the required detection limit for this isotope. Reported nondetect values exceeded the upper tolerance interval for well 66A, and the reported nondetect result for well 70A exceeded the lower tolerance interval for the March 2006 sampling. Nondetected values will show greater variability due to associated counting statistics.
Iodine-129	21.5 pCi/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.
Radium	0.5 pCi/L	No	No	No	No	Radium was not detected in any of the wells during the 2006 monitoring events; all detection limits were below the upper tolerance interval all wells. Reported values exceeded the lower tolerance interval for wells 66A and 70A for both sampling events. Nondetected values will show greater variability due to associated counting statistics.
Technetium-99	94.9 pCi/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, with an indication of downtrending concentrations in wells 67 and 70A.
Carbon tetrachloride	10.6 μg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval with no significant trends identified.
Total organic halides (TOX)	9.5 μg/L	No	Yes	No	Yes	All wells exhibited stable concentrations except for well 68 and well 66A during September 06 exceeding the upper tolerance level. TOX values that "spike" unaccountably have been seen in past analyses and have always followed by more typical values in the next analysis round. This analysis should be monitored in future rounds. Well 68 also slightly exceeded the upper tolerance limit in the March 2006 sampling.
Nitrogen in nitrite and nitrate	51.5 mg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years with an indication of downtrending concentrations in all wells.

Table 4-1. Summary of Tolerance Interval Comparisons and Trends. (4 Pages)

Analyte	Upper Tolerance Interval	Well(s) Exceeding Upper Tolerance Interval in CY 2006[a]				Comments
		70A	66A	67	68	
Total dissolved solids	573.6 mg/L	No	No	No	No	All wells exhibited stable concentrations below the tolerance interval.
Specific conductance	743.3 μS/m	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.
pH	8.0 units	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.
Turbidity	50 NTU	No	No	No	No	All wells exhibited concentrations below the tolerance interval, stable with regards to previous years.

[a] Well identification:

70A = upgradient monitoring well 699-36-70A
66A = downgradient monitoring well 699-35-66A
67 = downgradient monitoring well 699-36-67
68 = downgradient monitoring well 699-37-68
CY = calendar year

Numerous contaminant plumes that originated from past activities in the 200 West Area are near or beneath the ERDF site. Plumes originating from other sources and detected in ERDF monitoring wells include nitrogen (nitrate plus nitrite), carbon tetrachloride, gross alpha, gross beta, technetium-99, iodine-129, and uranium. The apparent trends in groundwater concentrations of these constituents are as follows:

- **Nitrogen**. Reported concentrations for nitrogen (nitrate plus nitrite) have remained fairly stable but show a very long-term downward trend for wells 699-36-67, 699-36-70A, and 699-36-67.

- **Carbon Tetrachloride**. Carbon tetrachloride concentrations have remained fairly consistent at levels below the upper tolerance interval within the ERDF monitoring wells.

- **Gross Alpha Activity**. Gross alpha activity concentrations have been slightly variable but generally within the calculated tolerance intervals since monitoring at the ERDF well network was initiated. Most recent samples have reported nondetect values.

- **Gross Beta Activity**. Activity concentrations for gross beta appear to have generally increased since monitoring of the ERDF wells was initiated in 1996. Recent samples suggest that gross beta activity may be stabilizing with some wells entering a downward trend.

- **Technetium-99**. Technetium-99 activity concentrations in the ERDF monitoring wells have remained fairly consistent and have generally been within tolerance intervals since monitoring was initiated in CY 1996. Recent samples suggest that activity has peaked in two wells and may be entering a downward trend.

- **Iodine-129**. Iodine-129 activity concentrations have remained fairly stable in all monitoring wells over the course of ERDF monitoring activities, and no wells have exceeded the upper tolerance interval.

- **Uranium**. Uranium concentrations in groundwater have generally been stable in the ERDF monitoring wells. Recent samples suggest that activity has peaked in most wells and may be entering a downward trend.

Downgradient well 699-36-67 continues to exhibit elevated zinc concentrations that are below the upper tolerance interval. The zinc concentrations in this well, and previously in well 699-37-68, were attributed to galvanic corrosion of the galvanized riser pipe with sampling pump equipment (BHI 2003, 2004, 2005b; WCH 2006). Monitoring well 699-36-67 has not been modified to remedy this issue, and the continued elevated zinc concentration in well 699-36-67 suggests that galvanic corrosion of the pumping equipment may be continuing. This well will be decommissioned and removed in late CY 2007 to allow for the next ERDF cell expansion. The replacement well should eliminate this zinc contamination issue. However, the tolerance interval for zinc should be recalculated after the new well is used.

4.2 SUMMARY OF LEACHATE ANALYSIS

Data associated with leachate sampling conducted from CY 2004 through CY 2006 are presented in Appendix C. Only analytical results that were reported as significant detects (>1 ppb) or that were reported as nondetected values but which are on the routine short list or groundwater monitoring COC lists are included in this report.

Leachate samples contained detectable concentrations of common metals, anions, and mobile radionuclides. Constituents that were generally increasing in concentration include chromium, potassium, specific conductance, bromide, nitrate, gross alpha, and total uranium. The following is a summary of those analytes for which concentrations appear to be increasing:

- **Chromium**. Chromium concentrations that were previously slowly increasing at a stable rate over time appear to have stabilized.

- **Nickel**. Nickel, which is on the long list of analytes and is monitored once every 2 years, appears to be increasing in concentration.

- **Potassium**. Potassium, which is on the long list of analytes and is monitored once every 2 years, appeared to be increasing in concentration based on data collected during CY 2004. The results of the CY 2006 analysis show stable concentrations.

- **Specific Conductance**. Specific conductance appeared to remain stable until December 2004, at which time a fairly significant increase was observed. During June 2005 the specific conductance value remained high and decreased slightly during December 2005. The June 2006 values remained stable with the previous December samples, but the values increased again to similar maximums seen in December 2004.

- **Bromide**. Bromide was not detected in leachate samples until June 2004, and the concentration of bromide generally appeared to be increasing through June 2005. Data from the December 2005 monitoring event indicates that bromide concentrations may have

either leveled off or may be decreasing. The most recent sampling indicates no real changes in the bromide concentrations. They remain near analytical detection limits.

- **Nitrate**. Nitrate concentrations had increased at a fairly steady rate through CY 2004 but appear to have dropped back to lower concentrations during CY 2005. Concentrations have remained stable though CY 2006.

- **Total Dissolved Solids**. Total dissolves solids are indicating a slight upward trend through the end of CY 2006. Continuing monitoring will be necessary to determine if a trend exists.

- **Gross Alpha**. Gross alpha activity concentrations have generally increased over the past 3 years.

- **Gross Beta**. Gross beta activity concentrations have generally increased over the past 3 years. The most recent results are comparable to the previous peak activity seen in the December 2002 samples.

- **Uranium**. Uranium activity concentrations have generally increased over the past 3 years and have reached a new maximum concentration.

4.3 SUMMARY OF WATER-LEVEL MEASUREMENTS

Groundwater monitoring wells in the ERDF well network have exhibited a gradual rate of decline in water levels since monitoring was initiated in September 1996. Water-level measurements collected during CY 2006 from wells 699-36-67, 699-37-68, 699-35-66A, and 699-36-70A show a rate of decline that is consistent with recent previous years.

Based on the measured water levels in the four ERDF monitoring wells, it was determined that the height of the water columns in the ERDF monitoring wells are 4.0 m (13 ft) at well 699-35-66A, 4.9 m (16 ft) of water at well 699-36-70A, 5.0 m (16 ft) of water at well 699-36-67, and 6.0 m (20 ft) of water at well 699-37-68. At the current average rate of decline, the other three monitoring wells would be available for use, as they are currently constructed, for approximately 15 to 22 years.

Wells 699-36-67 and 699-37-68 will be decommissioned and removed in late CY 2007 to allow for the ERDF expansion. Replacement wells will be put in place.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the CY 2006 analytical results, the statistical analysis of monitoring data, an evaluation of leachate monitoring data, and a review of the water-level measurement data, the following conclusions and recommendations are presented:

Chromium, vanadium, nitrogen, carbon tetrachloride, gross beta, technetium-99, iodine-129, and uranium were present in samples collected from the ERDF monitoring wells and are likely due to the migration of contaminants from non-ERDF sources in the 200 West Area.

Trends indicating increasing concentrations of nickel, gross alpha, gross beta, and uranium were noted for leachate samples collected over the past 3 years. Groundwater monitoring data for these constituents were examined to determine potential impacts to groundwater from ERDF operations. In all cases, groundwater concentrations for these constituents have remained stable, and it appears that ERDF leachate has not negatively impacted groundwater at this location. At this time, no additional analytes are recommended for the groundwater monitoring program based on this evaluation.

No additional analysis is necessary for the routine leachate sampling given that the groundwater and leachate sampling conducted to date does not indicate potential impacts to the groundwater from ERDF operations.

Replacement wells should be drilled to sufficient depth to minimize potential impacts as the groundwater levels continue to decrease with time.

The removal of the zinc contamination source associated with well 699-36-67 will require reevaluation of an appropriate tolerance interval for this element. Other elements may also be affected in an “step change” fashion and be require that other tolerance intervals be revaluated as well.

The current groundwater sampling frequency appears to be appropriate for future monitoring needs.

6.0 REFERENCES

BHI, 1995, *Preoperational Baseline and Site Characterization Report for the Environmental Restoration Disposal Facility,* BHI-00270, Rev. 00, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1996, *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*, BHI-00079, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2002, *Groundwater Monitoring and Sampling at the Environmental Restoration Disposal Facility, Calendar Year 2001*, BHI-01641, Rev. 0, Bechtel Hanford Inc., Richland, Washington.

BHI, 2003, *Groundwater and Leachate Monitoring and Sampling at the Environmental Restoration Disposal Facility, Calendar Year 2002*, BHI-01684, Rev. 0, Bechtel Hanford Inc., Richland, Washington.

BHI, 2004, *Groundwater and Leachate Monitoring and Sampling at the Environmental Restoration Disposal Facility, Calendar Year 2003*, BHI-01738, Rev. 0, Bechtel Hanford Inc., Richland, Washington.

BHI, 2005a, *Description of Work for Routine Groundwater Sampling at the Environmental Restoration Disposal Facility*, BHI-00873, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2005b, *Groundwater and Leachate Monitoring and Sampling at the Environmental Restoration Disposal Facility, Calendar Year 2004*, BHI-01777, Rev. 0, Bechtel Hanford Inc., Richland, Washington.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq.

EPA, 19890, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA/600/4-80-032, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1986, *Test Methods for Evaluating Solid Wastes: Physical Chemical Methods,* SW-846, (supplemented 1990), U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1995, *Record of Decision for the Environmental Restoration Disposal Facility*, *Hanford Site, 200 Area, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 1999, *Amended Record of Decision, Decision Summary and Responsiveness Summary for the Environmental Restoration Disposal Facility, Hanford Site – 200 Area, Benton County, Washington,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

References

EPA, 2003, *Amendment to the Record of Decision for the Environmental Restoration Disposal Facility, Hanford Site, 200 Area, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Faurote, J. M., 2000, *Groundwater Monitoring and Sampling at the Environmental Restoration Disposal Facility, Calendar Year 1996 Through 1999*, BHI-01382, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Hartman, M. J., L. F. Morasch, and W. D. Webber (eds.), 2005, *Summary of Hanford Site Groundwater Monitoring for Fiscal Year 2004*, PNNL-15070-SUM, Pacific Northwest National Laboratory, Richland, Washington.

Kopp, J. F. and G. D. McKee, 1983, *Methods for Chemical Analysis of Water and Wastes,* EPA-600/4-79-020, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Washington, D.C.

Lindahl, P. C., 1984, *Determination of Inorganic Anions in Aqueous and Solid Samples of Ion Chromatography*, EPA/600/4-84/017, Argonne National Laboratory, Argonne, Illinois.

PNNL, 2000, *Hanford Site Groundwater Monitoring Setting, Sources and Methods*, PNNL-13080, Pacific Northwest National Laboratory, Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

Swanson, L. C., V. J. Rohay, and J. M. Faurote, 1999, *Hydrogeologic Conceptual Model for the Carbon Tetrachloride and Uranium/Technetium Plumes in the 200 West Area: 1994 Through 1999 Update*, BHI-01311, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

WCH, 2006, *Groundwater Monitoring and Sampling at the Environmental Restoration Disposal Facility, Calendar Year 2005*, WCH-88, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX A

GROUNDWATER SAMPLING RESULTS, 1996-2006

Table A-1. Arsenic Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	3	B		1.1	B		3	B		1.7	B	1.7B	4.4	-0.1
Sep-96	2.6	B	0.0038B	0.98	B		2.1	B		0.67	B		4.4	-0.1
Mar-97	2.8	B	2.7B	2	B		2.5	B		1.4	B		4.4	-0.1
Sep-97	3.5	B	2.8B	1.9	B		3.3	B		1.6	U		4.4	-0.1
Mar-98	2.1	B		1.6	B	1.1B	2.6	B		0.6	U		4.4	-0.1
Aug-98	2.8	B		1	U		1.2	B		1.4	B	1U	4.4	-0.1
Mar-99	3.3	U		3.3	U	3.3U	3.3	U		3.3	U		4.4	-0.1
Sep-99	3.3	U	3.3U	3.3	U		3.3	U		3.3	U		4.4	-0.1
Mar-00													4.4	-0.1
Sep-00	2.6			2.4	U		3.2		3.8				4.4	-0.1
Mar-01	3			2.3	U		5.2			4.5		3.2	4.4	-0.1
Sep-01	5.6			22.8		10U	52.1	U		52.1	U		4.4	-0.1
Mar-02	4.4		3U	4.6			4.3			3	U		4.4	-0.1
Sep-02	4.4			4.5	U	3.3	3.8			3.3	U		4.4	-0.1
Mar-03	3.5	U		4.4			3.5	U		3.5	U		4.4	-0.1
Sep-03	4.2	U	4.2U	4.2	U		4.2	U		4.2	U		4.4	-0.1
Mar-04	3.4	U		3.40	U		3.4	U		3.4	U	3.4U	4.4	-0.1
Sep-04	3.6	U		3.7		3.6U	3.6	U		3.6	U		4.4	-0.1
Mar-05	34	U	34U	34	U		34	U		34	U		4.4	-0.1
Sep-05	4.7	U		23.6	U		23.6	U		27.5		23.6U	4.4	-0.1
Mar-06													4.4	-0.1
Sep-06	5.3			3.7	U	3.7U	4.7			3.7	U		4.4	-0.1

NOTE: Values are in ug/L.

Table A-2. Barium Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	46	B		81.9	B		92.1	B		92	B	90.6B	123.3	27.7
Sep-96	42.9	B	0.0402B	66.7	B		80.8	B		77.9	B		123.3	27.7
Mar-97	46.3	B	47B	87.6	B		93.4	B		102	B		123.3	27.7
Jun-97							83.6						123.3	27.7
Sep-97	42.2	B	40.9B	64.6	B		80	B	76.6	69.6	B		123.3	27.7
Mar-98	43.7			66.8		66.6	78.4		82.4	79			123.3	27.7
Aug-98	39.8	B		58.2	B		74.1	B		71.1	B	69B	123.3	27.7
Mar-99	40.5			59		58.4	76.1		72.8	73.2			123.3	27.7
Sep-99	40.3	B	40.2B	54.1	B		75.6	B		69.8	B		123.3	27.7
Jan-00							77.8	B					123.3	27.7
Mar-00													123.3	27.7
Sep-00	38.9			51.5			73.8		74.3				123.3	27.7
Dec-00							77.3	B					123.3	27.7
Mar-01	38			50			71.4			68.1		69.9	123.3	27.7
Sep-01	40.5			200	U	200U	71.2			64.9			123.3	27.7
Dec-01							74.6	B					123.3	27.7
Mar-02	38.3		38.5	56.2			66.9			68.7			123.3	27.7
Sep-02	39.8			58.1		0.31	69.4			67.9			123.3	27.7
Mar-03	37.8			49.6			70			64.3			123.3	27.7
Sep-03	39.8		41.4	58.3			71.5			65			123.3	27.7
Mar-04	38.9			56.1			56.5			66.6		66.5	123.3	27.7
Sep-04	39.9	C		56.3	C	57.2C	60.9	C		68.7	C		123.3	27.7
Mar-05	39.3		39.5	56.4			60.4			61.6			123.3	27.7
Sep-05	37.1	C		48.4			54.5			65.4		63.8	123.3	27.7
Mar-06	35.4		38.1	55.2			58.1			64.5			123.3	27.7
Sep-06	39.2	C		53		52.1	55.9	C		60.5			123.3	27.7

NOTE: Values are in ug/L.

Table A-3. Chromium Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	13.4			4.4	U		5.9	B		7.7	B	5.1B	16.5	-3.6
Sep-96	12.1		0.0205	4.4	U		4.4	U		4.4	U		16.5	-3.6
Mar-97	12.2		12	2.7	U		3.9	B		4.5	B		16.5	-3.6
Jun-97							7.9	B					16.5	-3.6
Sep-97	13.4		13.3	3.3	B		3.5	U	3.6B	3.5	U		16.5	-3.6
Mar-98	16.6			3.3	B	3.6B	6.8	B	5.4B	4.1	B		16.5	-3.6
Aug-98	13.5			4.2	U		4.2	U		4.2	U	4.2U	16.5	-3.6
Mar-99	13.9			2.3	2.2		6.1	B	2.2	3.1			16.5	-3.6
Sep-99	14.8		14.8	2.5	B		4.4	B		3.1	B		16.5	-3.6
Jan-00							4.4	B					16.5	-3.6
Mar-00													16.5	-3.6
Sep-00	16.3			1.6			4.6		4.9				16.5	-3.6
Dec-00							5.7	U					16.5	-3.6
Mar-01	14.8			2.4			4.1			4.5		3.8	16.5	-3.6
Sep-01	21.1			10	U	10U	7.4			5.4			16.5	-3.6
Dec-01							1.5	B					16.5	-3.6
Mar-02	16.3		16.2	5.2			6			11.3			16.5	-3.6
Sep-02	16.2			5.6		1.2	5.5			8.7			16.5	-3.6
Mar-03	16.3			2.5			3.8			9.9			16.5	-3.6
Sep-03	16.2	C	17.2C	3.6			4.9			12	C		16.5	-3.6
Mar-04	16.6			4.1			4			4.4		3.8	16.5	-3.6
Sep-04	15.6			5.5		5.3	3.8			11.6			16.5	-3.6
Mar-05	15.9		17.1	9.7	U		9.7	U		9.7	U		16.5	-3.6
Sep-05	14.4			3.6	UC		3.6	UC		3.6	UC	5.4UC	16.5	-3.6
Mar-06	14.6		15.8	6.4	U		6.4	U		6.4	U		16.5	-3.6
Sep-06	16.3			2.5		2.6	4.8			3.4			16.5	-3.6

NOTE: Values are in ug/L.

Table A-4. Lead Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	1	UJ		1	UJ		1	UJ		1	UJ	1UJ	70.4	-28.5
Sep-96	42.1	U	0.002U	42.1	U		42.1	U		42.1	U		70.4	-28.5
Mar-97	26	U	26U	26	U		34.8	B		26	U		70.4	-28.5
Sep-97	1.1	U	1.1U	1.1	U		1.1	U		47.1	U		70.4	-28.5
Mar-98	1.1	U		1.1	U	1.1U	1.1	U		2.4	B		70.4	-28.5
Aug-98	30.2	U		30.2	U		30.2	U		30.2	U	30.2U	70.4	-28.5
Mar-99	1.8	U		1.8	U	1.8U	1.8	U		2.5			70.4	-28.5
Sep-99	2.1	U	4	49.2			6.7			2.4	B		70.4	-28.5
Mar-00													70.4	-28.5
Sep-00	2.1	U		2.1	U		2.1	U	2.1U				70.4	-28.5
Mar-01	2.6	U		2.6	U		2.6	U		2.6	U	2.6U	70.4	-28.5
Sep-01	3.7			6.8		3U	22.7	U		22.7	U		70.4	-28.5
Mar-02	2.2	U	2.8	2.2	U		2.2	U		4.2			70.4	-28.5
Sep-02	2.4	U		2.4	U	2.4U	2.4	U		2.4	U		70.4	-28.5
Mar-03	2.6	U		2.3	U		2.6	U		2.6	U		70.4	-28.5
Sep-03	1.9	U	1.9U	1.9	U		1.9	U		1.9	U		70.4	-28.5
Mar-04	2	U		2	U		2	U		2	U	2	70.4	-28.5
Sep-04	1.9	U		1.9	U	1.9U	1.9	U		1.9	U		70.4	-28.5
Mar-05	24.7	U	24.7U	24.7	U		24.7	U		24.7	U		70.4	-28.5
Sep-05	2.9	U		31.9	U		31.9	U		31.9	U	31.9U	70.4	-28.5
Mar-06													70.4	-28.5
Sep-06	3.3	UC		1.2	U	1.2U	1.2	U		1.2	U		70.4	-28.5

NOTE: Values are in ug/L.

Table A-5. Selenium Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	2.1	B		2.6	B		3.5	B		3.4	B	3.6B	5.6	1.5
Sep-96	3.1	B	0.003U	3.8	B		4.1	B		4.8	B		5.6	1.5
Mar-97	2.6	BN	2.3BN	3.5	BN		3.1	BN		3.9	BN		5.6	1.5
Sep-97	3.2	B	2.9B	3.6	B		4.8	B		4.6	B		5.6	1.5
Mar-98	3.2	B		3.6	B	3.6B	4.4	B		4.2	B		5.6	1.5
Aug-98	3.2	B		4.5	B		5.8			5.8		5.5	5.6	1.5
Mar-99	5.2			3.6	U	4.5	7.6			4.2			5.6	1.5
Sep-99	3.7	U	5.2	3.7	U		7.3			4.6	B		5.6	1.5
Mar-00													5.6	1.5
Sep-00	3.4			3.5			4		5.5				5.6	1.5
Mar-01	2.6	U		3.1			3.4			2.6		2.6U	5.6	1.5
Sep-01	5.9			5	U	19.8	62.1	U		62.1	U		5.6	1.5
Mar-02	7.7		7.9	3.6	U		7.8			7.7			5.6	1.5
Sep-02	4.1	U		4.1	U	4.1U	7.4			4.1	U		5.6	1.5
Mar-03	3.6	U		5.7			4.4	U		3.8	U		5.6	1.5
Sep-03	3.8		4.4	3.6			6.9			5.7			5.6	1.5
Mar-04	4.2			5.6			7.4			3.4	U	3.4U	5.6	1.5
Sep-04	3.9	U		3.9	U	3.9U	3.9	U		3.9	U		5.6	1.5
Mar-05	48.5	U	48.5U	48.5	U		48.5	U		48.5	U		5.6	1.5
Sep-05	6.2	C		44	U		44	U		44	U	44.0U	5.6	1.5
Mar-06													5.6	1.5
Sep-06	4.4			3.3		5.2	3.7			3			5.6	1.5

NOTE: Values are in ug/L.

Table A-6. Uranium Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Sep-95							2.98	U					3.4	1.9
Mar-96	2.64			2.24			2.94			2.74		2.77	3.4	1.9
Sep-96	2.4			2.26			2.42			2.21			3.4	1.9
Mar-97	2.7			2.69			3.16			2.87			3.4	1.9
Sep-97	2.76		2.55	2.43			3.01			2.38			3.4	1.9
Mar-98	2.33			2.49		2.44	2.99			2.32			3.4	1.9
Aug-98	2.59			2.48			3.34			2.34		2.36	3.4	1.9
Mar-99	2.6			2.8		3	3.4			2.7			3.4	1.9
Sep-99	2.65		2.53	2.63			3.41			2.58			3.4	1.9
Mar-00													3.4	1.9
Sep-00	3.27			3.19			3.17		3.62				3.4	1.9
Mar-01	2.31			2.36			3.12			2.83		2.79	3.4	1.9
Sep-01	2.42			2.25		2.28	3.06			2.65			3.4	1.9
Mar-02	2.44		2.52	2.46			3.22			2.84			3.4	1.9
Sep-02	2.25			2.27		2.14	2.99			2.58			3.4	1.9
Mar-03	2.33			4.22			3.27			2.79			3.4	1.9
Sep-03	2.19		2.22	2.49			2.97			2.58			3.4	1.9
Mar-04	2.24			2.12			2.94			2.8		3.07	3.4	1.9
Sep-04	2.35	B		2.15	B	2.38B	2.95	B		2.59	B		3.4	1.9
Mar-05	2.26		2.3	2.14			2.86			2.85			3.4	1.9
Sep-05	2			1.63			2.34			2.09		2.2	3.4	1.9
Mar-06	2.35		2.3	2.14			2.94			2.68			3.4	1.9
Sep-06	2.12			1.94		1.95	2.53			2.72			3.4	1.9

NOTE: Values are in ug/L.

Table A-7. Tin Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	35.3	U		35.3	U		35.3	U		40.1	B	35.3U	55.6	-2.1
Sep-96	33.5	U	0.033U	33.5	U		33.5	U		33.5	U		55.6	-2.1
Mar-97	24.7	U	24.7U	24.7	U		29	B		24.7	U		55.6	-2.1
Sep-97	5.6	U	5.6U	5.6	U		5.6	U		33.2	U		55.6	-2.1
Mar-98	4.9	U		4.9	U	4.9U	4.9	U		4.9	U		55.6	-2.1
Aug-98	28	U		28	U		28	U		28	U	28U	55.6	-2.1
Mar-99	2.7	U		2.7	U	2.7U	2.7	U		2.7	U		55.6	-2.1
Sep-99	2.1	U	2.1U	2.1	U		2.1	U		2.1	U		55.6	-2.1
Mar-00													55.6	-2.1
Sep-00													55.6	-2.1
Mar-01	3.5	U		3.5	U		3.5	U		3.5	U	3.5U	55.6	-2.1
Sep-01	2.4	U		100	U	100U	13.9	U		13.9	U		55.6	-2.1
Mar-02	3.3	U	3.3U	3.3	U		3.3	U		3.3	U		55.6	-2.1
Sep-02	4.7	U		4.7	U	4.7U	4.7	U		4.7	U		55.6	-2.1
Mar-03	3.6	U		5.8	U		3.6	U		3.6	U		55.6	-2.1
Sep-03	5.6	U	5.6U	5.6	U		5.6	U		5.6	U		55.6	-2.1
Mar-04	3.6	U		3.6	U		3.6	U		3.6	U	3.6U	55.6	-2.1
Sep-04	4	U		4	U	4U	4	U		4	U		55.6	-2.1
Mar-05													55.6	-2.1
Sep-05	5.1	U											55.6	-2.1
Mar-06													55.6	-2.1
Sep-06	3.5	U		3.5	U	4.6	3.5	U		3.5	U		55.6	-2.1

NOTE: Values are in ug/L.

Table A-8. Vanadium Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	26.8	J		12.6	J		23.6	J		14.4	J	15.1J	41	9.9
Sep-96	33.4	B	0.026B	25.1	B		32.9	B		24.3	B		41	9.9
Mar-97	33.2	B	30.3B	26	B		28.9	B		25.3	B		41	9.9
Jun-97							36.2						41	9.9
Sep-97	27.8	B	27.2B	18.8	B		25.7	B	28.8	24.9	B		41	9.9
Mar-98	29			18.6		18.3	26.8		28.4	23			41	9.9
Aug-98	39.5	B		30.1	B		39.5	B		36	B	33.9B	41	9.9
Mar-99	28.3			13.9		15	25.2		30	23.6			41	9.9
Sep-99	28.7	B	28.6B	17.5	B		26.4	B		23.5	B		41	9.9
Jan-00							25.7	B					41	9.9
Mar-00													41	9.9
Sep-00	27.5			15.5			27.2		27.3				41	9.9
Dec-00							27.1	B					41	9.9
Mar-01	27.1			16.5			25.8			25		25.3	41	9.9
Sep-01	28.5			50	U	50U	26.2			22.8			41	9.9
Dec-01							26.2	B					41	9.9
Mar-02	26.6		27.4	23.4			25.6			23.4			41	9.9
Sep-02	28.6			26.7		1.1	28.8			24.3			41	9.9
Mar-03	28.5			22.1			26.8			23.8			41	9.9
Sep-03	25.9	26.9		24.4			26.2			16.2			41	9.9
Mar-04	26.8			24.9			24.6			24.2		24.7	41	9.9
Sep-04	27	C		25.4	C	25.2	26.1			24.8	C		41	9.9
Mar-05	25.8		27.4	25.1			25.9			23.3			41	9.9
Sep-05	25.4			21.5			24.9			27.4		23.4	41	9.9
Mar-06	25.3		27.1	24.9			26.4			22.9			41	9.9
Sep-06	28.8	C		23.7	C	23.2C	28.6	C		22.7	C		41	9.9

NOTE: Values are in ug/L.

Table A-9. Zinc Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	13.7	U		146			8.5	U		368		155	757	-354.3
Sep-96	15.4	B	0.003U	260			23.1			665			757	-354.3
Mar-97	26.5		26.7	382			55.4			507			757	-354.3
Jun-97							12						757	-354.3
Sep-97	8.1	B	5.7	339			10.3		5.1U	394			757	-354.3
Mar-98	5.8	B		318		321	6.1	B	2.2U	386			757	-354.3
Aug-98	10.3	B		241			4.7	B		663		629	757	-354.3
Mar-99	2.6			164		144	10.6		0.8U	347			757	-354.3
Sep-99	2.9	B	3.5B	215			0.8	U		350			757	-354.3
Jan-00							10.4	B					757	-354.3
Mar-00													757	-354.3
Sep-00	7.4			357			2.8		4.2				757	-354.3
Dec-00							7.1	U					757	-354.3
Mar-01	4.4			262			0.94			17.4		17.5	757	-354.3
Sep-01	5.8			310		325	17.1			24.6			757	-354.3
Dec-01							1.3	U					757	-354.3
Mar-02	3.1		2.6	280			0.4	U		33.4			757	-354.3
Sep-02	7.1			329		0.54	2.3			33.6			757	-354.3
Mar-03	13.4	C		180			15	C		34.4	C		757	-354.3
Sep-03	23.7	C	2.6C	296			3.1			8.9	C		757	-354.3
Mar-04	7.8	C		317	C		5.1	C		12.9	C	9.9C	757	-354.3
Sep-04	6.9			288		286C	7.3	C		12.8			757	-354.3
Mar-05	29.6	UC	5.6UC	316	C		3.8	UC		15.4	UC		757	-354.3
Sep-05	14.5	UC		266	C		8.5	UC		9.1	UC	8.6UC	757	-354.3
Mar-06	9	UC	15.9UC	286	C		17	UC		12.4	UC		757	-354.3
Sep-06	8.7	UC		259	C	260C	10.3	UC		6.6	UC		757	-354.3

NOTE: Values are in ug/L.

Table A-10. Alkalinity Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	138			121			113			124		125	151.8	101.2
Sep-96	143			125			117			129			151.8	101.2
Mar-97	147			129			113			121			151.8	101.2
Jun-97							114						151.8	101.2
Sep-97	138		142	125			119			125			151.8	101.2
Dec-97							121						151.8	101.2
Mar-98	140			122		123	120			127			151.8	101.2
Jun-98							122						151.8	101.2
Aug-98	143			124			124			131	131		151.8	101.2
Dec-98							127						151.8	101.2
Mar-99	143			124		124	123			129			151.8	101.2
Jun-99							118						151.8	101.2
Sep-99	140		139	123			122			130			151.8	101.2
Jan-00							135						151.8	101.2
Mar-00													151.8	101.2
Jun-00							137						151.8	101.2
Sep-00	160			137			119		123				151.8	101.2
Mar-01	137			145			120			152		144	151.8	101.2
Jun-01							130						151.8	101.2
Sep-01	132			126		128	124			130			151.8	101.2
Mar-02	138		135	124			126			132			151.8	101.2
Sep-02	135			130		128	131			146			151.8	101.2
Mar-03	128			120			111			113			151.8	101.2
Sep-03	130		129	128			114			123			151.8	101.2
Mar-04	147			132			140			136		141	151.8	101.2
Sep-04	137			121		130	126			121			151.8	101.2
Mar-05	142		138	128			128			130			151.8	101.2

Table A-10. Alkalinity Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Sep-05	138			132			126			126		130	151.8	101.2
Mar-06	139		139	128			124			128			151.8	101.2
Sep-06	137			125		117	120			123			151.8	101.2

NOTE: Values are in mg/L.

Table A-11. Chloride Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	21.1			24.2			24.2			20.2		20.6	25.9	17.1
Sep-96	19			22.9			21.7			20.1			25.9	17.1
Mar-97	19.2			23.7						20.08			25.9	17.1
Jun-97							22	D					25.9	17.1
Sep-97	20.5		19.9	22.9			22.4			21			25.9	17.1
Dec-97							20.6	D					25.9	17.1
Mar-98	16.1	CD		21.4	D	21.4D	20.9	CD		19.6	CD		25.9	17.1
Jun-98							21						25.9	17.1
Aug-98	18.3			23.7			21.4			20.7		21	25.9	17.1
Dec-98							20.5	D					25.9	17.1
Mar-99	19.5			24.9		24.4	20.2	CD	23.3	21.7			25.9	17.1
Jun-99							21.2	CD					25.9	17.1
Sep-99	18.9		19.9	26.3			23.2			28.1			25.9	17.1
Jan-00							20.4	D					25.9	17.1
Mar-00													25.9	17.1
Jun-00							20.5	DC					25.9	17.1
Sep-00	18.4			25.7			21.4		22.4				25.9	17.1
Dec-00							21.9	D					25.9	17.1
Mar-01	18.6			25.7			17.2			22.3		27.6	25.9	17.1
Jun-01							16.8	D					25.9	17.1
Sep-01	19			23.4		24.4	20.5			23.3			25.9	17.1
Dec-01							18.6	D					25.9	17.1
Mar-02	16.6		16.8	22.6			19.3			25.2			25.9	17.1
Sep-02	18			25.6		24.5	20.7			26.6			25.9	17.1
Mar-03	18.3			22.5			22.8			28.2			25.9	17.1
Sep-03	15.7	D	15.6D	22.6	D		23	D		23.8	D		25.9	17.1
Mar-04	15	D		21.9	D		16.5	D		23.8	D	24.3D	25.9	17.1

Table A-11. Chloride Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Sep-04	15.7			22.3		23.1	17.4			24.1			25.9	17.1
Mar-05	20.7		20.1	27.7			22.5			19			25.9	17.1
Sep-05	13.4	D		23	D		17.1	D		24.8	D	24.5D	25.9	17.1
Mar-06	13.2	D	13.9D	23.5	D		16.7	D		20.6	D		25.9	17.1
Sep-06	15.2			21.2	D	21D	17.5			24.5	D		25.9	17.1

NOTE: Values are in mg/L.

Table A-12. Fluoride Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	0.34			0.4			0.42			0.36		0.36	0.5	0.2
Sep-96	0.34			0.37			0.41			0.33			0.5	0.2
Mar-97	0.34			0.36						0.3			0.5	0.2
Jun-97							0.406						0.5	0.2
Sep-97	0.39		0.334	0.348			0.415			0.331			0.5	0.2
Dec-97							0.378						0.5	0.2
Mar-98	0.304			0.363		0.364	0.371			0.33			0.5	0.2
Jun-98							0.383						0.5	0.2
Aug-98	0.342			0.355			0.362			0.343		0.34	0.5	0.2
Dec-98							0.399						0.5	0.2
Mar-99	0.5	U		0.5	U	0.5U	0.335		0.5U	0.5	U		0.5	0.2
Jun-99							0.373						0.5	0.2
Sep-99	0.5	U	0.5U	0.5	U		0.5	U		0.5	U		0.5	0.2
Jan-00							0.41						0.5	0.2
Mar-00													0.5	0.2
Jun-00							0.39						0.5	0.2
Sep-00	0.5	U		0.5	U		0.5	U	0.5U				0.5	0.2
Dec-00							0.36	C					0.5	0.2
Mar-01	0.5	U		2.5	U		0.5	U		2.5	U	2.5U	0.5	0.2
Jun-01							0.35						0.5	0.2
Sep-01	1	U		1	U	1U	0.5	U		0.5	U		0.5	0.2
Dec-01							0.36						0.5	0.2
Mar-02	0.25	U	0.25U	0.26			0.28			0.25	U		0.5	0.2
Sep-02	0.25	U		0.25	U	0.25U	0.25	U		0.357			0.5	0.2
Mar-03	0.25	U		0.34			0.3			0.34			0.5	0.2
Sep-03	0.3		0.31	0.28			0.3			0.25	U		0.5	0.2
Mar-04	0.3			0.32			0.37			0.286		0.327	0.5	0.2
Sep-04	0.28			0.34		0.29	0.3			0.26			0.5	0.2

Table A-12. Fluoride Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-05	0.25		.25U	0.27			0.28			0.29			0.5	0.2
Sep-05	0.268			0.316			0.343			0.289		0.284	0.5	0.2
Mar-06	0.27		0.3	0.29			0.31			0.26			0.5	0.2
Sep-06	0.3			0.35		0.37	0.28			0.26			0.5	0.2

NOTE: Values are in mg/L.

Table A-13. Sulfate Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	24.2			29.9			30.7			28.9		28.7	37.8	22.3
Sep-96	25.2			32.2			33.2			30.3			37.8	22.3
Mar-97	27			31.5						30.5			37.8	22.3
Jun-97							33.8	D					37.8	22.3
Sep-97	26.6		26.1	32.6			34.9			31.4			37.8	22.3
Dec-97							34.5	D					37.8	22.3
Mar-98	22.7	D		31.6	D	31.4D	34.8	D		31.2	D		37.8	22.3
Jun-98							35						37.8	22.3
Aug-98	26			30.7			35.4			31.8		31.5	37.8	22.3
Dec-98							36.8	D					37.8	22.3
Mar-99	26.8			32.4		32	37.3		35.2D	30.8			37.8	22.3
Jun-99							33.2	D					37.8	22.3
Sep-99	25.9		25.8	32.5			34.6			31.3			37.8	22.3
Jan-00							34.5	D					37.8	22.3
Mar-00													37.8	22.3
Jun-00							34.2	D					37.8	22.3
Sep-00	30.5			31.7			37.6		35.9				37.8	22.3
Dec-00							36.8	D					37.8	22.3
Mar-01	26.9			36			31.6			37.8		39.5	37.8	22.3
Jun-01							36.9	D					37.8	22.3
Sep-01	27.8			30.3		30.8	34.5			31			37.8	22.3
Dec-01							33.1	D					37.8	22.3
Mar-02	25.6		25.6	29.2			33.8			30.5			37.8	22.3
Sep-02	26.2			30.2		29.2	32.7			31.1			37.8	22.3
Mar-03	26			30			34.7			31			37.8	22.3
Sep-03	26.6	D	26.7D	31.3	D		34.3	D		31.5	D		37.8	22.3
Mar-04	26.7	D		31	D		32.2	D		31.5	D	32.4D	37.8	22.3
Sep-04	29.2			33.7		36	37.4			34.5			37.8	22.3

Table A-13. Sulfate Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-05	27.7		27.3	32.7			33			24			37.8	22.3
Sep-05	24	D		32.8	D		32.3	D		31.5	D	31.1D	37.8	22.3
Mar-06	27.3	D	27.4D	30.9	D		30.5	D		30.9	D		37.8	22.3
Sep-06	26.6			30.2	D	29.4D	29.9			29.8	D		37.8	22.3

NOTE: Values are in mg/L.

Table A-14. Gross Alpha Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	1.45	J		2.12	J		2.28	J		2.43	J	1.73J	3.3	-0.6
Sep-96	1.69	J		0.109	U		1.57	J		1.15	U		3.3	-0.6
Mar-97	1.69	J	0.199U	1.31	U		1.26	J		0.837	U		3.3	-0.6
Jun-97							1.68	J					3.3	-0.6
Sep-97	0.39	U	1.66J	0.791	U		1.2	J		2.5	J		3.3	-0.6
Dec-97							2.36	J					3.3	-0.6
Mar-98	1.32	J		0.659	U	1.4J	2.17	J		0.683	U		3.3	-0.6
Jun-98							2.17	U					3.3	-0.6
Aug-98	0.431	U		2.3	J		2.89	J		2.45	J	3.37	3.3	-0.6
Dec-98							1.87	J					3.3	-0.6
Mar-99	2.7	J		3		1.3U	1.68	U	1.3U	1.5	U		3.3	-0.6
Jun-99							2.75	J					3.3	-0.6
Sep-99	2.64	J	0.565U	0.535	U		1.31	U	0.928U	1.55	U		3.3	-0.6
Jan-00							3.75						3.3	-0.6
Mar-00													3.3	-0.6
Jun-00							3.29						3.3	-0.6
Sep-00	0.34	U		0.5	U		0.266	U	1.28U				3.3	-0.6
Dec-00							2.06	U					3.3	-0.6
Mar-01	0.303	U		1.01	U		2.33	J		0.812	U	1.43U	3.3	-0.6
Sep-01	-0.386	U		0.976	U	0.751U	1.12	U		0.374	U		3.3	-0.6
Mar-02	0.884	U	0.227U	0.522	U		0.363	U		0.016	U		3.3	-0.6
Sep-02	0.348	U		0.38	U	0.91U	0.289	U		-0.377	U		3.3	-0.6
Mar-03	0.748	U		6.01			0.865	U		1.68			3.3	-0.6
Sep-03	1.44		0.882U	1.11	U		1.16	U		1.64			3.3	-0.6
Mar-04	2.26			1.73	U		1.83	U		1.52		2.13	3.3	-0.6
Sep-04	1.21			-0.435	U	-0.17U	0.487	U		0.531	U		3.3	-0.6
Mar-05	1.53		0.817U	1.33			0.913	U		1.68			3.3	-0.6
Sep-05	0.862	U		1.06	U		0.646	U		1.16	U	1.78	3.3	-0.6

Table A-14. Gross Alpha Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-06	-0.264	U	1.16U	-0.146	U		1.12	U		0.117	U		3.3	-0.6
Sep-06	-0.059	U		1.34	U	3.05	1.86			-0.156	U		3.3	-0.6

NOTE: Values are in pCi/L.

Table A-15. Gross Beta Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	10.9			22.4			20.4			16		15.5	31.7	4.8
Sep-96	13.2			26.9			25.7			17.6			31.7	4.8
Mar-97	11.2		10.5	21.6			23.2			13.5			31.7	4.8
Jun-97							16.3						31.7	4.8
Sep-97	10.2		12.7	20.7			21			15.9			31.7	4.8
Dec-97							21.4						31.7	4.8
Mar-98	10.5			26.4		25.4	20.2			14.5			31.7	4.8
Jun-98							44.7						31.7	4.8
Aug-98	17.1			27.4			25.1			19.1		13.4	31.7	4.8
Dec-98							21.3						31.7	4.8
Mar-99	25			17		67	25.1		56	27			31.7	4.8
Jun-99							25.8						31.7	4.8
Sep-99	25.1		25.8	57.2			38		50.2	27.1			31.7	4.8
Jan-00							21.7						31.7	4.8
Mar-00													31.7	4.8
Jun-00							21.6						31.7	4.8
Sep-00	27.6			49.2			49.9		47.4				31.7	4.8
Dec-00							23.4						31.7	4.8
Mar-01	26.2			59.4			47.8			31.9		35.5	31.7	4.8
Sep-01	29.8			41.2		39.6	41.2			29.8			31.7	4.8
Mar-02	28		28.5	39.1			42.7			30.8			31.7	4.8
Sep-02	23.3			28.3		26.3	28.7			21.4			31.7	4.8
Mar-03	38.8			47			44.3			36.8			31.7	4.8
Sep-03	38.1		38.1	35.6			44			41.5			31.7	4.8
Mar-04	25.8			28.1			29.8			36.2		41.3	31.7	4.8
Sep-04	39.1			34.1		34.3	33.8			38.3			31.7	4.8
Mar-05	41.4		38.4	32.9			33.2			36.9			31.7	4.8
Sep-05	44.6			35.8			27.8			41.6		41.2	31.7	4.8

Table A-15. Gross Beta Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-06	45.4		44.6	30			30			45.4			31.7	4.8
Sep-06	45.5			27.6		33.2	29			40.5			31.7	4.8

NOTE: Values are in pCi/L.

Table A-16. Carbon-14 Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	22.3	J		6.76	J		4.26	J		4.72	J	2.48U	26.8	-10.5
Sep-96													26.8	-10.5
Mar-97	21.6	J	22.2J	11.1	J		3.94	U		3.81	U		26.8	-10.5
Sep-97	16.7	J	10.7J	3.27	U		1.6	U		5.43	U		26.8	-10.5
Mar-98	19.4	J		4.5	U	7.16U	3.69	U		-1.49	U		26.8	-10.5
Aug-98	18.5	J		8.63	J		2.07	U		6.46	U	6.4U	26.8	-10.5
Mar-99	25	U		9.9	U	12U	-6.1	U		-6.5	U		26.8	-10.5
Sep-99	14.1	U	7.43U	-2.74	U		-9.54	U		-5.94	U		26.8	-10.5
Mar-00													26.8	-10.5
Sep-00	35.2	U		13.7	U		3.75	U	4.81U				26.8	-10.5
Mar-01	9.56	U		43.4	U		-28.1	U		47.2	U	57J	26.8	-10.5
Sep-01	32.5	U		6.73	U	22.5U	-15.1	U		-1.16	U		26.8	-10.5
Mar-02	14	U	21.4U	11.6	U		21.7	U		13.2	U		26.8	-10.5
Sep-02	5.02	U		17	U	32.6U	-1.55	U		8.45	U		26.8	-10.5
Mar-03	-6.69	U		-0.225	U		25.2	U		1.78	U		26.8	-10.5
Sep-03	0.446	U	3.32U	5.74	U		-10.3	U		-4.5	U		26.8	-10.5
Mar-04	33.9	U		16.4	U		10.2	U		9.75	U	-12.4U	26.8	-10.5
Sep-04	8.8	U		0	U	6.99U	1.22	U		2.45	U		26.8	-10.5
Mar-05	11.8	U	42.2U	38.6	U		17.8	U		28.9	U		26.8	-10.5
Sep-05	19.9	U		8.17	U		-2.4	U		-2.37	U	-10.7U	26.8	-10.5
Mar-06	34.2	U	16.1U	1.44	U		-22.6	U		6.04	U		26.8	-10.5
Sep-06	15.8	U		1.42	U	-5.16U	13.6	U		-4.74	U		26.8	-10.5

NOTE: Values are in pCi/L.

Table A-17. Iodine-129 Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Jan-95							38.8	J					21.5	-2.4
Jun-95							19.9						21.5	-2.4
Jan-96				3.06	U					1.04	U		21.5	-2.4
Mar-96	9.4			9.42			18.7			6.01		3.69U	21.5	-2.4
Sep-96	7.54			11.9			13.7			2.22	U		21.5	-2.4
Mar-97	10.1		11	7.81			11.8			2.82	J		21.5	-2.4
Jun-97							12.3						21.5	-2.4
Sep-97	9.52		11.3	9.73			16.2			3.03	J		21.5	-2.4
Mar-98	8.07		4.54U	13.2		9.83U	15.2		15.2	1.62	U	1.62U	21.5	-2.4
Aug-98	9.6			12.2			15.2			2.57		2.78	21.5	-2.4
Mar-99	6.1			7.9		1.2U	14.4		3.8U	2.9	U		21.5	-2.4
Sep-99	5.68		6.96	9.24			6.54	U		1.87	U		21.5	-2.4
Jan-00							12.9						21.5	-2.4
Mar-00													21.5	-2.4
Sep-00	0.307	U		11			13.9		13.1				21.5	-2.4
Dec-00							13.3						21.5	-2.4
Mar-01	4.63	U		13.8			16.7			6.72		2.74U	21.5	-2.4
Jun-01							7.37						21.5	-2.4
Sep-01	3.1	U		12.3		-5.52U	13.8			4.59	J		21.5	-2.4
Dec-01							9.14						21.5	-2.4
Mar-02	4.09		3.79	9.71		10.7	13.9			2.2		2.16U	21.5	-2.4
Sep-02	4.66	J		8.34		12	14.3			2.3	U		21.5	-2.4
Mar-03	4.97			12.1			14.2			3.43			21.5	-2.4
Sep-03	2.91	U	-9.28U	7.88	U		13.4			-1.82	U		21.5	-2.4
Mar-04	4.86			11.8			11			2.44	U	1.64U	21.5	-2.4
Sep-04	4.99			13.6		13.3	6.53			2.52	U		21.5	-2.4
Mar-05	5.25	U	3.66U	15.5			10.6			-1.61	U		21.5	-2.4
Sep-05	5.30			14.6			12.5			2.42	U	2.45U	21.5	-2.4

Table A-17. Iodine-129 Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-06	2.87	U	1.91U	13.5			7.66			0.379	U		21.5	-2.4
Sep-06	3.02	U		12.7		15.4	10.1			3.58	U		21.5	-2.4

NOTE: Values are in pCi/L.

Table A-18. Technetium-99 Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Sep-95							60.2						94.9	-6.3
Mar-96	25.5			65			64.2			31		32	94.9	-6.3
Sep-96	20.3			53.5			52.3			32.1			94.9	-6.3
Mar-97	20	21.6		77.5			59.9			30			94.9	-6.3
Jun-97							64						94.9	-6.3
Sep-97	18.9		17.3	66.8			57			34.8			94.9	-6.3
Dec-97							64.2						94.9	-6.3
Mar-98	23.2			68.6		75.4	78.2			23.5			94.9	-6.3
Jun-98							73.6						94.9	-6.3
Aug-98	29.4			74.9			77.4			36.5		16.5	94.9	-6.3
Dec-98							72						94.9	-6.3
Mar-99	0	U		86		83	70.5	U	0U	36			94.9	-6.3
Jun-99							0.0737	J					94.9	-6.3
Sep-99	40.4		34.3	85.2			90.1			44.6			94.9	-6.3
Jan-00							126						94.9	-6.3
Mar-01													94.9	-6.3
Jun-00							85.7						94.9	-6.3
Sep-00	35.6			80.1			85.6		76.5				94.9	-6.3
Dec-00							60.9						94.9	-6.3
Mar-01	45.5			75.9			92			40.2		42.3	94.9	-6.3
Jun-01							61.3						94.9	-6.3
Sep-01	47.6			56.5		63.7	72.3			46.9			94.9	-6.3
Dec-01							66.3						94.9	-6.3
Mar-02	51.4		61.3	71.8			76.1			46.3			94.9	-6.3
Sep-02	52.8			59.7		51.6	67.1			58.8			94.9	-6.3
Mar-03	61.3			62.1			66.3			56.5			94.9	-6.3
Sep-03	57.7		59.5	54.5			58.3			58.7			94.9	-6.3
Mar-04	59.4			54.7			56.4			66.7		68.1	94.9	-6.3

Table A-18. Technetium-99 Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Sep-04	67.2			60.6		63.5	56.5			66.3			94.9	-6.3
Mar-05	68.6		78.4	66.2			57.2			65.5			94.9	-6.3
Sep-05	73.1			57			50.9			71.8		73	94.9	-6.3
Mar-06	74.3		80	59.2			46			60.4			94.9	-6.3
Sep-06	75.2			47.1		48.3	40.7			64.5			94.9	-6.3

NOTE: Values are in pCi/L.

Table A-19. Radium Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	0.141	U		0.207	U		0.521	J		0.276	U	0.235J	0.5	-0.2
Sep-96													0.5	-0.2
Mar-97	0.0235	U		0.065	J		0.0577	U		0.07	J		0.5	-0.2
Sep-97	0.0723	U	0.036U	0.0353	U		0.123	U		0.0748	U		0.5	-0.2
Mar-98	0.078	U		0.21	J	0.103U	0.148	U		0.114	U		0.5	-0.2
Aug-98													0.5	-0.2
Mar-99													0.5	-0.2
Sep-99													0.5	-0.2
Mar-00													0.5	-0.2
Sep-00	0.827	U		1.99	J		-0.261	U	0.182U				0.5	-0.2
Mar-01	0.144	U		0.431	U		-0.037	U		0.033	U	0.931U	0.5	-0.2
Sep-01	-0.387	U		-0.537	U	0.506U	0.675	U		0.18	U		0.5	-0.2
Mar-02	0.94	J	0.599U	0.063	U		0.383	U		0.258	U		0.5	-0.2
Sep-02	-0.147	U		0.332	U	-0.143U	0.147	U		-0.271	U		0.5	-0.2
Mar-03	0.345	U		0.474	U		-0.392	U		0.637	U		0.5	-0.2
Sep-03	-0.63	U	-.009U	0.92	U		0.039	U		0.039	U		0.5	-0.2
Mar-04	0.232	U		0.611	U		0.57	U		0.265	U	0.411U	0.5	-0.2
Sep-04	-0.022	U		-0.05	U	-0.128U	-0.083	U		-0.051	U		0.5	-0.2
Mar-05	0.144	U	-.045U	0.089	U		0.037	U		-0.058	U		0.5	-0.2
Sep-05	0.168	U		0.085	U		0.059	U		0.036	U	0.04U	0.5	-0.2
Mar-06	-0.294	U	-0.042U	0.045	U		-0.199	U		-0.194	U		0.5	-0.2
Sep-06	-0.215	U		-0.117	U	0.073U	-0.327	U		0.06	U		0.5	-0.2

NOTE: Values are in pCi/L.

Table A-20. Carbon Tetrachloride Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	5	U		2	J		4	J		5	U	5U	10.6	0
Sep-96	4	J	5U	7			7			5	J		10.6	0
Mar-97	4	J	3J	6			7			4	J		10.6	0
Jun-97							7						10.6	0
Sep-97	5	U	5U	4	J		11			5	U		10.6	0
Mar-98													10.6	0
Jun-98							10						10.6	0
Aug-98	2	J		6			5	U		3	J	3J	10.6	0
Mar-99	1	J		4	J	4J	7			3	J		10.6	0
Sep-99	5	U	1J	4	J		5			3	J		10.6	0
Mar-00													10.6	0
Jun-00							7.1						10.6	0
Sep-00	1	J		5			9		9				10.6	0
Mar-01	1	J		6			7			5.26		5	10.6	0
Sep-01	5	U		4	J	4J	7			5	J		10.6	0
Mar-02	1	J	1J	5			9			5			10.6	0
Sep-02	1.011	J		5.018		5.243	8			5.854			10.6	0
Mar-03	5	U		4	J		6			5	J		10.6	0
Sep-03	5	U	5U	4	J		6			5			10.6	0
Mar-04	1	J		6			8			7.416			10.6	0
Sep-04	1	J		5		6	8			7		7.223	10.6	0
Mar-05	1	J	1J	6		6	7			8			10.6	0
Sep-05	5	U		6			7			8		8	10.6	0
Mar-06	1	J	1J	4	J		5	J		10			10.6	0
Sep-06	5	U		5	J	5J	6			6			10.6	0

NOTE: Values are in ug/L.

Table A-21. Nitrogen in Nitrate/Nitrite Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Sep-95							36.6						51.5	-8.7
Mar-96	4.58			20.2			31.9			35.6		36.5	51.5	-8.7
Sep-96	4.19			20.6			26.1			33.7			51.5	-8.7
Mar-97	0.419		40	22.6			21.3			34.1			51.5	-8.7
Sep-97	4.13		4.19	18.9			24.6			35.4			51.5	-8.7
Mar-98	4.62	D		20.4	D	20.1D	25.3	D		34.3	D		51.5	-8.7
Aug-98	4.14			24			26.3			35.2		34.5	51.5	-8.7
Mar-99	4.53			20.8		20.6	24.6			31.8			51.5	-8.7
Sep-99	4.6		4.5	20			23.7			33			51.5	-8.7
Mar-00													51.5	-8.7
Sep-00	4.7			19.1			24.6		23.2				51.5	-8.7
Mar-01	5.5			19.9			24.7			31.3		32.2	51.5	-8.7
Sep-01	4.6			17.3		17.6	23			29.3			51.5	-8.7
Mar-02	4.6		4.5	16.3			18.9			27.9			51.5	-8.7
Sep-02	4.48			15.8		15.8	19			26.6			51.5	-8.7
Mar-03	4.8			17			21.4			29.7			51.5	-8.7
Sep-03	5.1	D	5.1D	15.9	D		19.3	D		29.2	D		51.5	-8.7
Mar-04	4.8	D		14.4	D		16.8	D		32.4	D	26D	51.5	-8.7
Sep-04	4.9			15.3		15.8	16.8			26.8			51.5	-8.7
Mar-05	5.1		5.1	14.3			15.6			25.8			51.5	-8.7
Sep-05	7.72	D		12.5	D		14.4	D		24.6	D	24D	51.5	-8.7
Mar-06	4.6	D	4.6D	12.9	D		13.8	D		23.7	D		51.5	-8.7
Sep-06	5.3			13.4	D	13.2D	13.3			22.8	D		51.5	-8.7

NOTE: Values are in mg/L.

Table A-22. Total Organic Halides.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	6.6	J		10.5	J		5.6	J		6.6	J	5	9.5	1.2
Sep-96	5	U		5	U		5	U		5	U		9.5	1.2
Mar-97	5	U		5	U		2.9			5	U		9.5	1.2
Jun-97							11.7						9.5	1.2
Sep-97	6.05		4.62U	7.05			4.62	U		5	U		9.5	1.2
Mar-98	4.62	U		4.62	U	4.62U	4.62	U		4.62	U		9.5	1.2
Aug-98	5.9			5.85			6.7			5	U	5U	9.5	1.2
Mar-99	24	U		12	U	24U	34.5			14.3			9.5	1.2
Sep-99	128		12U	206			12	U		12	U		9.5	1.2
Jan-00							14						9.5	1.2
Mar-00													9.5	1.2
Jun-00							4.4	B					9.5	1.2
Sep-00	206			271			180		181				9.5	1.2
Dec-00							10.6						9.5	1.2
Mar-01	17.1	U		20	U		20	U		20	U	20U	9.5	1.2
Sep-01	6.5	U		8.7	U	7.4U	6.5	U		6.6	U		9.5	1.2
Dec-01							13.2						9.5	1.2
Mar-02	5.2	U	6.1	9.3			9.5			5.2	U		9.5	1.2
Sep-02	10.5			5.6		5.2U	8.5			60.6			9.5	1.2
Mar-03	5.2	U		6.3			5.3			5.2	U		9.5	1.2
Sep-03	5.2	U	5.2U	6.2			6.8			6.3			9.5	1.2
Mar-04	6.7			5.7			9.8			5.2	U	6.4	9.5	1.2
Sep-04	5.2	U		5.2	U	5.2U	6.7			5.2	U		9.5	1.3
Mar-05	5	U	6.3	8.1			12.8			11.4			9.5	1.3
Sep-05	5	U		8.83			12.2			7.46		5.51	9.5	1.3
Mar-06	5.2	UC	15.9C	5.2	UC		9.2	C		10.6	D		9.5	1.3
Sep-06	16.9			5	U	5U	6.1			38.9			9.5	1.3

NOTE: Values are in ug/L.

Table A-23. Total Dissolved Solids Data.

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-96	254			340			384			401		420	573.6	170.9
Sep-96	236			367			411			457			573.6	170.9
Mar-97	283		279	404			390			514			573.6	170.9
Jun-97							398						573.6	170.9
Sep-97	277		278	377			401			463			573.6	170.9
Dec-97							379						573.6	170.9
Mar-98	322			320		309	327			456			573.6	170.9
Jun-98							472						573.6	170.9
Aug-98	296			406			422			491		507	573.6	170.9
Dec-98							344						573.6	170.9
Mar-99	280			380		400	390		406	440			573.6	170.9
Jun-99							407						573.6	170.9
Sep-99	270		280	370			410			470			573.6	170.9
Jan-00							355						573.6	170.9
Mar-00													573.6	170.9
Jun-00							434						573.6	170.9
Sep-00	270			340			550		520				573.6	170.9
Mar-01	278			407			400			349		436	573.6	170.9
Sep-01	305			384		391	420			535			573.6	170.9
Mar-02	265		258	333			358			430			573.6	170.9
Sep-02	276			326		328	344			446			573.6	170.9
Mar-03	260			337			349			407			573.6	170.9
Sep-03	269		271	361			381			5	U		573.6	170.9
Mar-04	262			323			326			438		442	573.6	170.9
Sep-04	262			331		330	355			392			573.6	170.9
Mar-05	205		253	278			339			386			573.6	170.9
Sep-05	292			387			403			460		500	573.6	170.9
Mar-06	274		269	314			302			391			573.6	170.9
Sep-06	270			464		409	311			521			573.6	170.9

NOTE: Values are in mg/L.

Table A-24. Turbidity Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Jun-95							5.02						50	-34.9
Sep-95							5.01						50	-34.9
Mar-96	0.34	J		0.3	J		0.26	J		3.21	J	1.48J	50	-34.9
Sep-96													50	-34.9
Mar-97	0.71			8.91			0.84			60.6			50	-34.9
Jun-97							1.78						50	-34.9
Sep-97	1.9			14.4			1.33			4.56			50	-34.9
Dec-97							1.38						50	-34.9
Mar-98	1.65			23.4			3.52			4.85			50	-34.9
Jun-98							3.99						50	-34.9
Aug-98	1.29			90.5						2.95			50	-34.9
Dec-98							2.62						50	-34.9
Mar-99				52.6			4.54						50	-34.9
Jun-99							3.25						50	-34.9
Sep-99	2.29			87.2			2.68						50	-34.9
Jan-00							4.12						50	-34.9
Mar-00													50	-34.9
Jun-00							1.63						50	-34.9
Sep-00	2.3			142			2.6						50	-34.9
Dec-00							2.41						50	-34.9
Mar-01	1.71			38.2			1.06			16.7			50	-34.9
Jun-01							1.71						50	-34.9
Sep-01	1.54			3.35			1.17			6.62			50	-34.9
Dec-01							4.12						50	-34.9
Mar-02	1.85			11.1			5			7.4			50	-34.9
Sep-02	2.2			5.6			4.7			6.7			50	-34.9
Mar-03	1.86			962			1.29			15			50	-34.9
Sep-03	2.41			41.6			2.68			49.7			50	-34.9

Table A-24. Turbidity Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-04	2.01			16.3			2.49			15			50	-34.9
Sep-04	2.93			16.9			4.65			4.19			50	-34.9
Mar-05	2.78			7.53			2.13			4.16			50	-34.9
Sep-05	0.73			4.61			3.88			3.94			50	-34.9
Mar-06	1.93			7.21			1.39			4.07			50	-34.9
Sep-06	1.12			4.02			4.41			4.6			50	-34.9

NOTE: Values are in NTU.

Table A-25. pH Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Jan-95							6.4						8	7.5
Jun-95							7						8	7.5
Sep-95							7.65						8	7.5
Jan-96				7.71						7.68			8	7.5
Mar-96	7.66						7.8						8	7.5
Sep-96							7.7						8	7.5
Mar-97	7.82			7.68			7.67			7.64			8	7.5
Jun-97							7.75						8	7.5
Sep-97	7.86			7.86			7.76			7.74			8	7.5
Dec-97							7.81						8	7.5
Mar-98	7.86			7.8			7.64			7.71			8	7.5
Jun-98							7.72						8	7.5
Aug-98	7.95			8.31			7.95			7.77			8	7.5
Dec-98							7.8						8	7.5
Mar-99				7.72			7.71						8	7.5
Jun-99							7.61						8	7.5
Sep-99	7.95			7.69			7.82						8	7.5
Jan-00							7.77						8	7.5
Mar-00													8	7.5
Jun-00							7.71						8	7.5
Sep-00	7.9			7.7			7.8						8	7.5
Dec-00							7.75						8	7.5
Mar-01	8.56			7.7			7.84			7.74			8	7.5
Jun-01							7.68						8	7.5
Sep-01	7.77			7.7			7.7			7.78			8	7.5
Dec-01							7.74						8	7.5
Mar-02	7.89			7.83			7.73			7.8			8	7.5
Sep-02	7.9			7.8			7.7			7.8			8	7.5

Table A-25. pH Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Mar-03	7.9			7.79			7.71			7.76			8	7.5
Sep-03	7.85			7.76			7.63			7.67			8	7.5
Mar-04	7.89			7.77			7.63			7.78			8	7.5
Sep-04	7.76			7.78			7.68			7.76			8	7.5
Mar-05	7.86			7.74			7.64			7.83			8	7.5
Sep-05	7.84			7.74			7.59			7.81			8	7.5
Mar-06	7.9			7.74			7.69			7.86			8	7.5
Sep-06	7.81			7.78			7.72			7.8			8	7.5

Table A-26. Specific Conductance Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Jan-95							641						743	362.7
Jun-95							578						743	362.7
Sep-95							653						743	362.7
Jan-96				461						547			743	362.7
Mar-96	402						618						743	362.7
Sep-96							595						743	362.7
Mar-97	428			545			562			630			743	362.7
Jun-97							591						743	362.7
Sep-97	423			540			575			614			743	362.7
Dec-97							483						743	362.7
Mar-98	441			534			565			671			743	362.7
Jun-98							505						743	362.7
Aug-98	405			510			546			270			743	362.7
Dec-98							558		571C				743	362.7
Mar-99				577			585		552C				743	362.7
Jun-99							556	C	571C				743	362.7
Sep-99	413			541			578						743	362.7
Jan-00							533	C	584				743	362.7
Mar-00													743	362.7
Jun-00							576						743	362.7
Sep-00	412			537			565						743	362.7
Dec-00							537	C	563				743	362.7
Mar-01	416			533			555			618			743	362.7
Jun-01							547						743	362.7
Sep-01	423			522			540			601			743	362.7
Dec-01							460		530				743	362.7
Mar-02	473			518			522			605			743	362.7

Table A-26. Specific Conductance Data. (2 Pages)

Sample Date	699-35-66A (Down Gradient)	Qual	DUP	699-36-67 (Down Gradient)	Qual	DUP	699-36-70A (Up Gradient)	Qual	DUP	699-37-68 (Down Gradient)	Qual	DUP	Upper Limit	Lower Limit
Sep-02	412			517			537			605			743	362.7
Mar-03	409			505			535			594			743	362.7
Sep-03	395			502			500			425			743	362.7
Mar-04	409			500			487			604			743	362.7
Sep-04	406			486			483			588			743	362.7
Mar-05	405			487			470			596			743	362.7
Sep-05	402			471			469			562			743	362.7
Mar-06	402			482			465			573			743	362.7
Sep-06	407			475			454			553			743	362.7

NOTE: Values are in uS/cm.

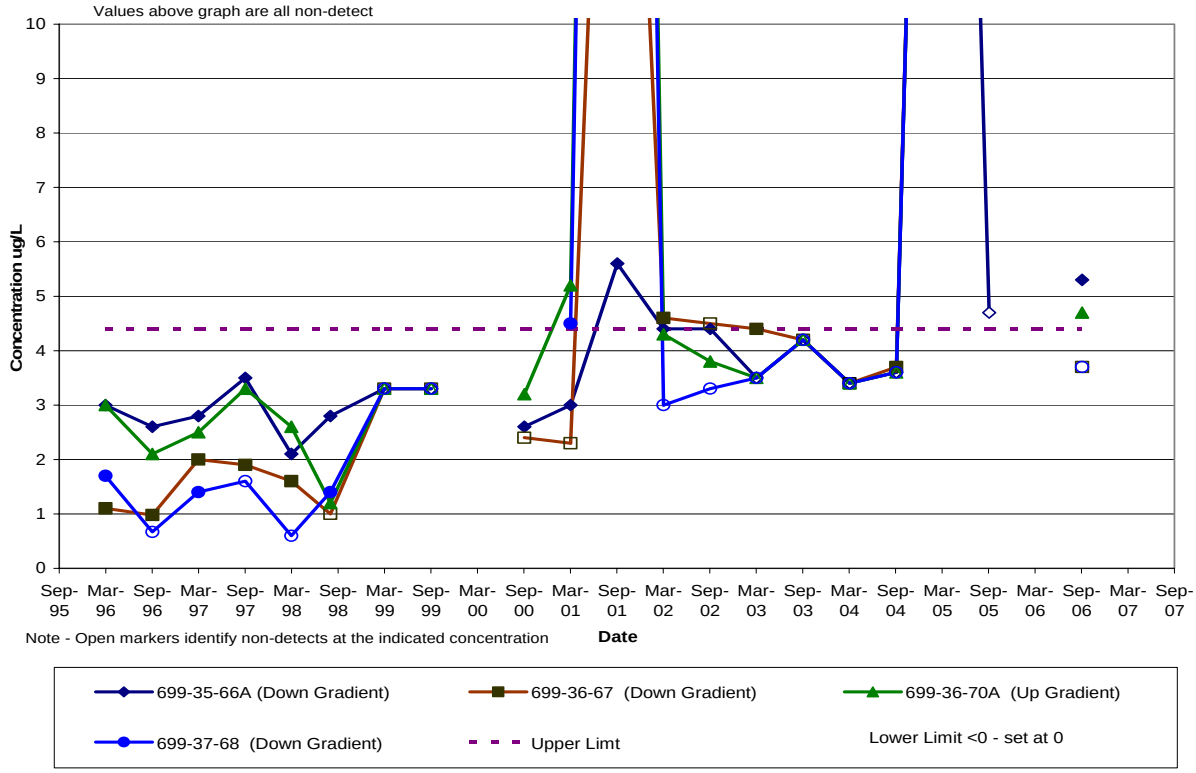
Appendix A – Groundwater Sampling Results, 1996-2006

APPENDIX B

GROUNDWATER SAMPLING TRENDS, 1996-2006

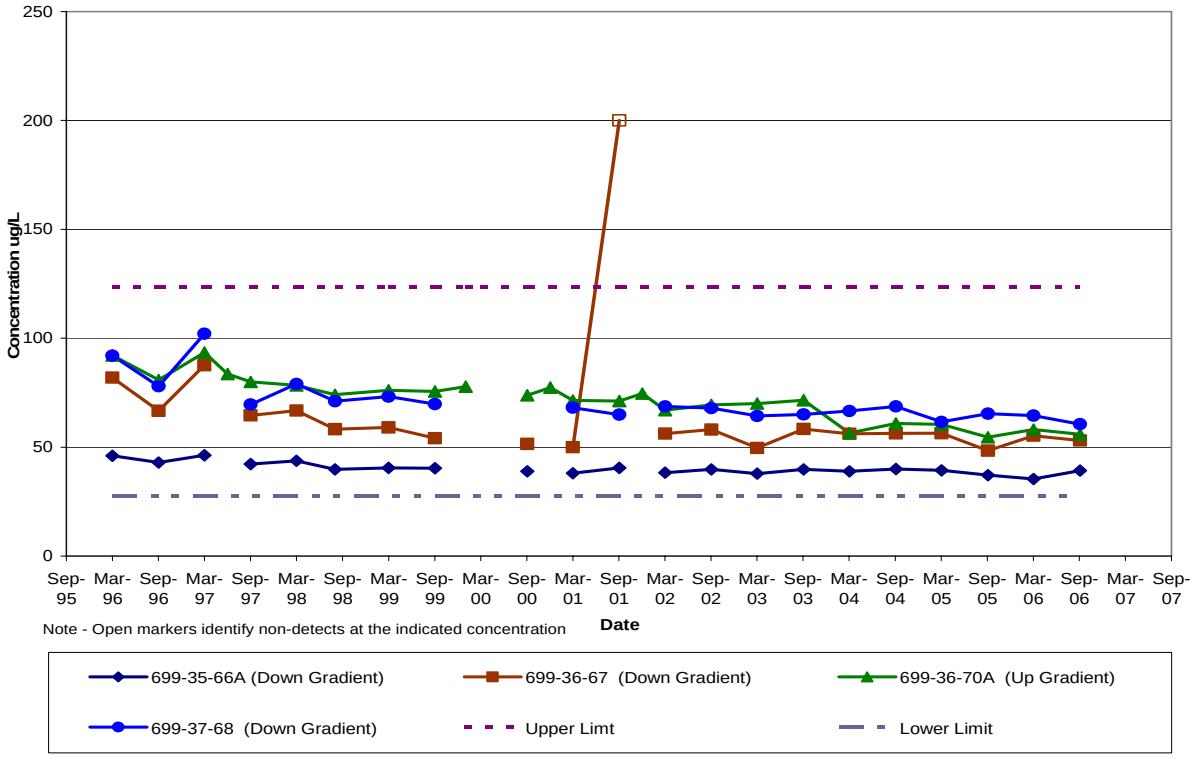
Appendix B – Groundwater Sampling Trends, 1996-2006

Figure B-1 Arsenic (Filtered)



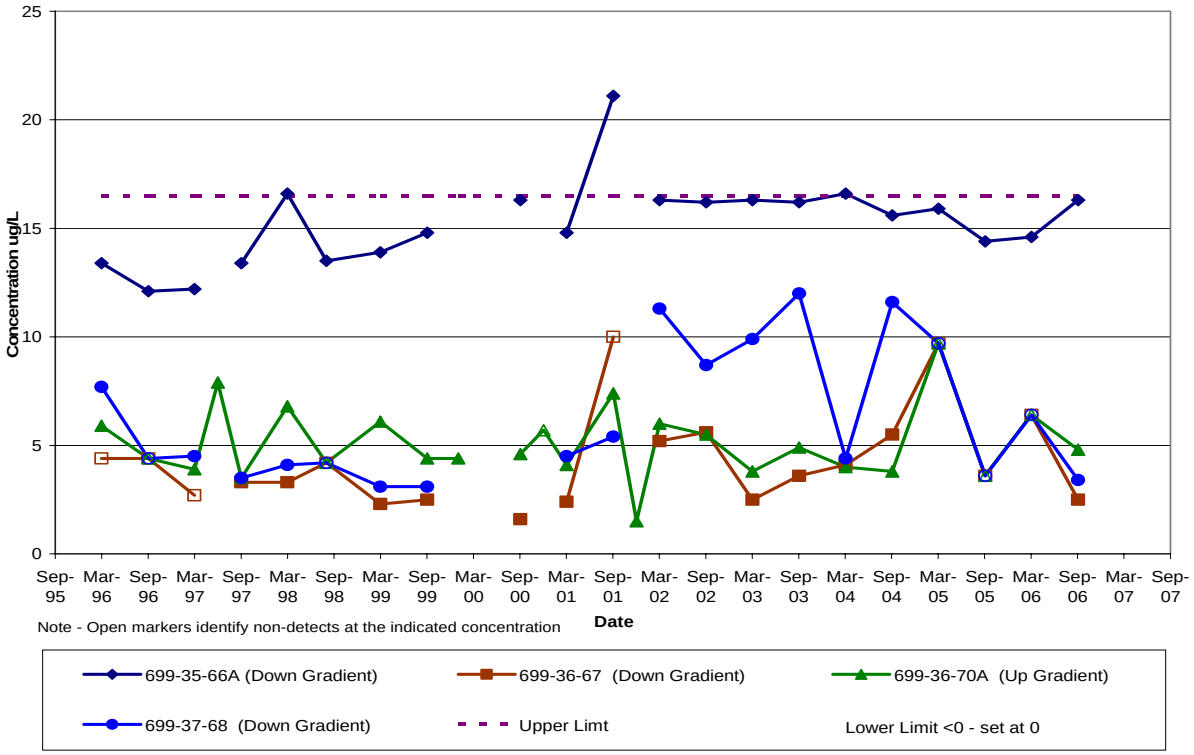
Appendix B – Groundwater Sampling Trends, 1996-2006

Figure B-2 Barium (Filtered)



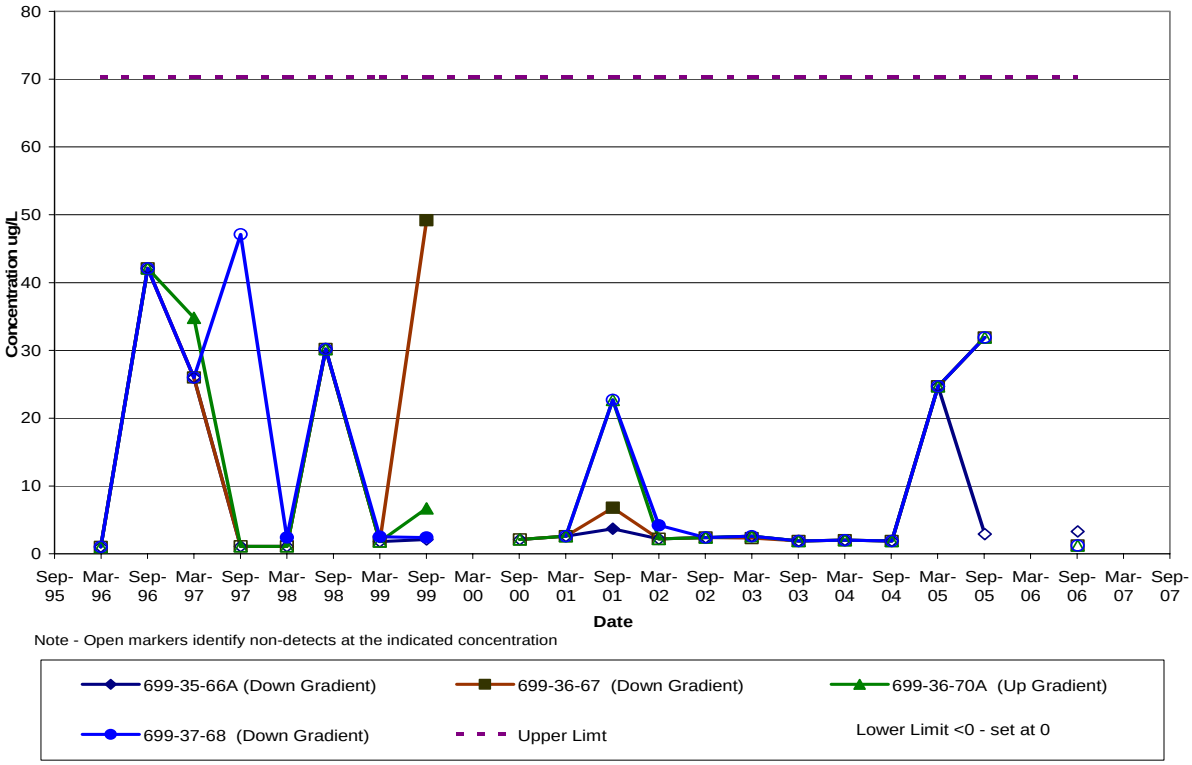
Appendix B – Groundwater Sampling Trends, 1996-2006

Figure B-3 Chromium (Filtered)



Appendix B – Groundwater Sampling Trends, 1996-2006

Figure B-4 Lead (Filtered)



Appendix B – Groundwater Sampling Trends, 1996-2006

Figure B-5 Selenium (Filtered)

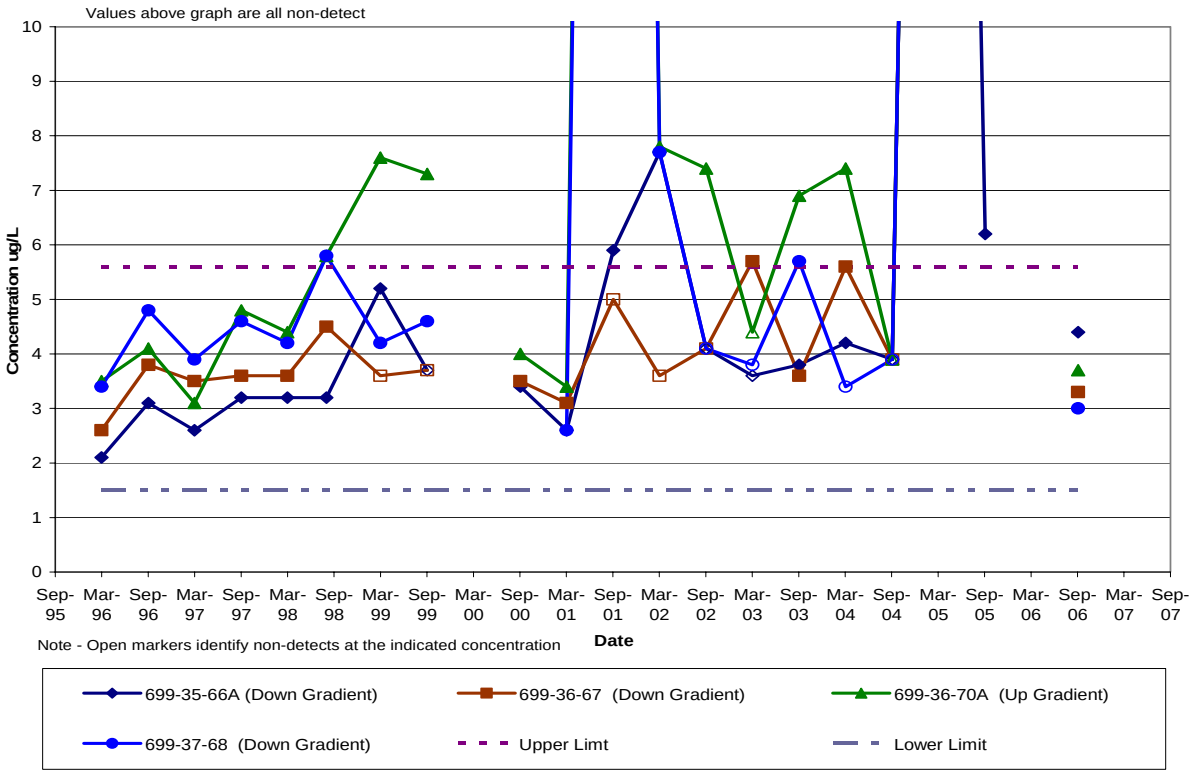


Figure B-6 Uranium (Filtered)

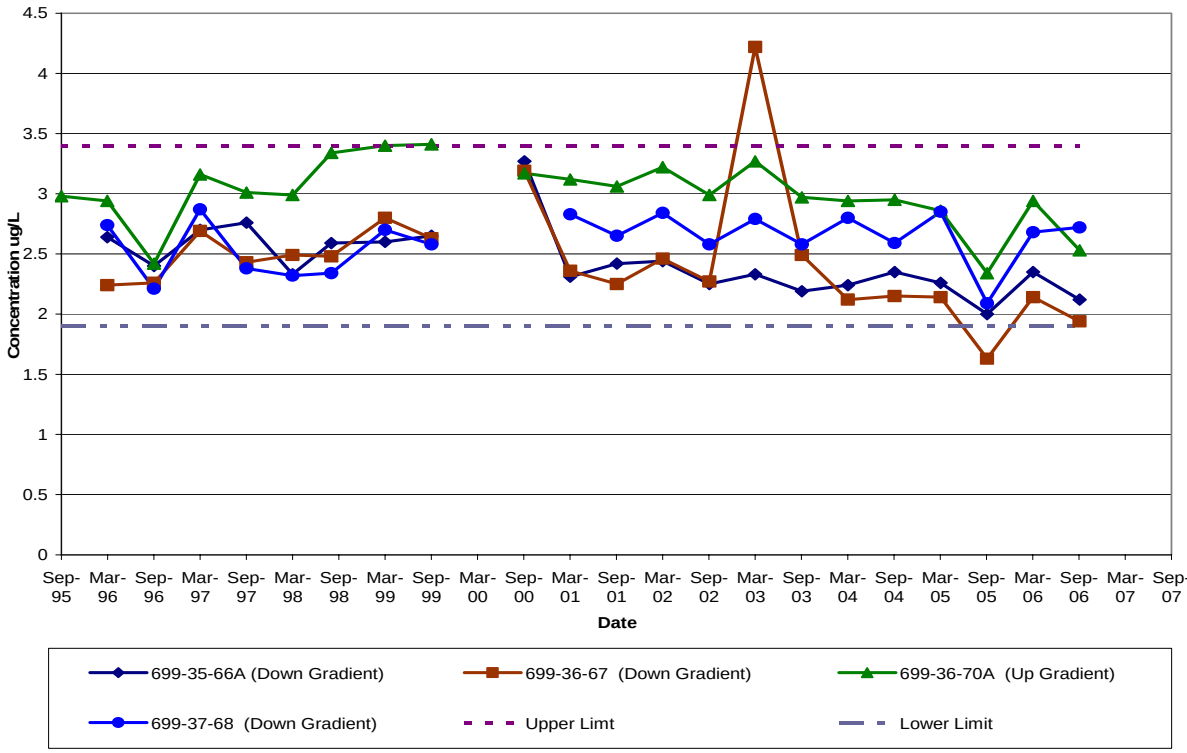


Figure B-7 Tin (Filtered)

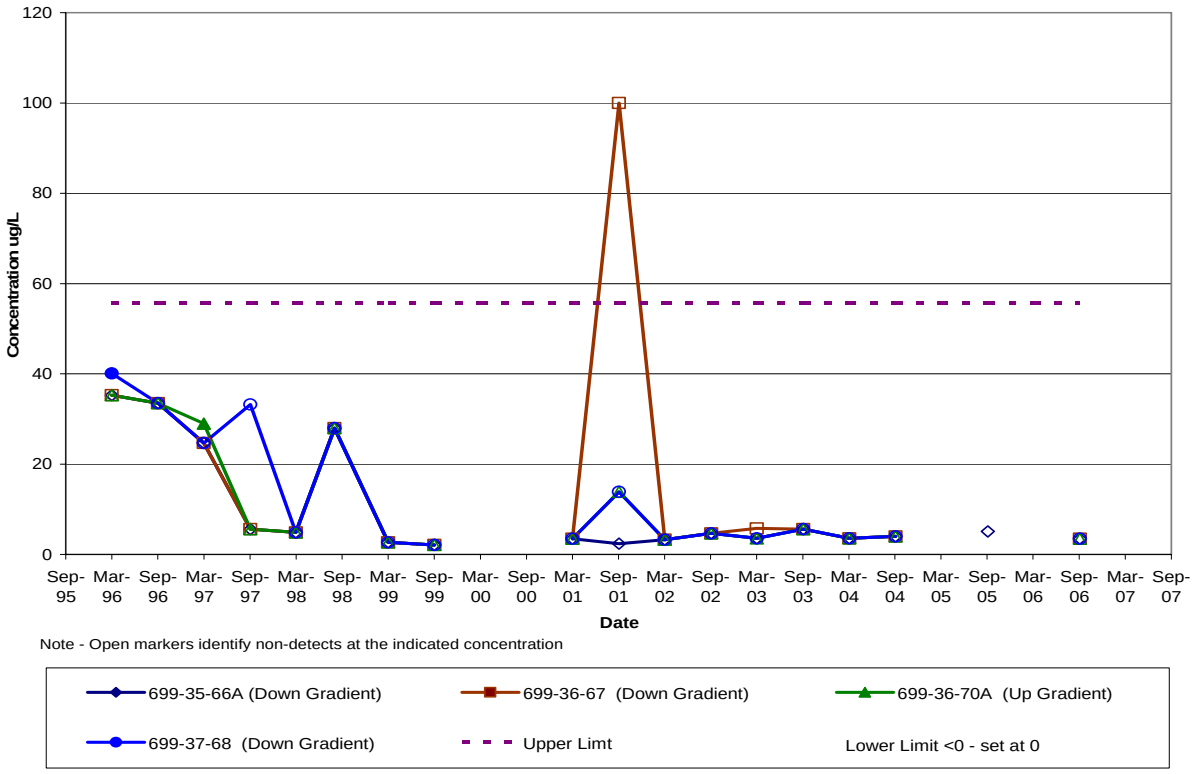


Figure B-8 Vanadium (Filtered)

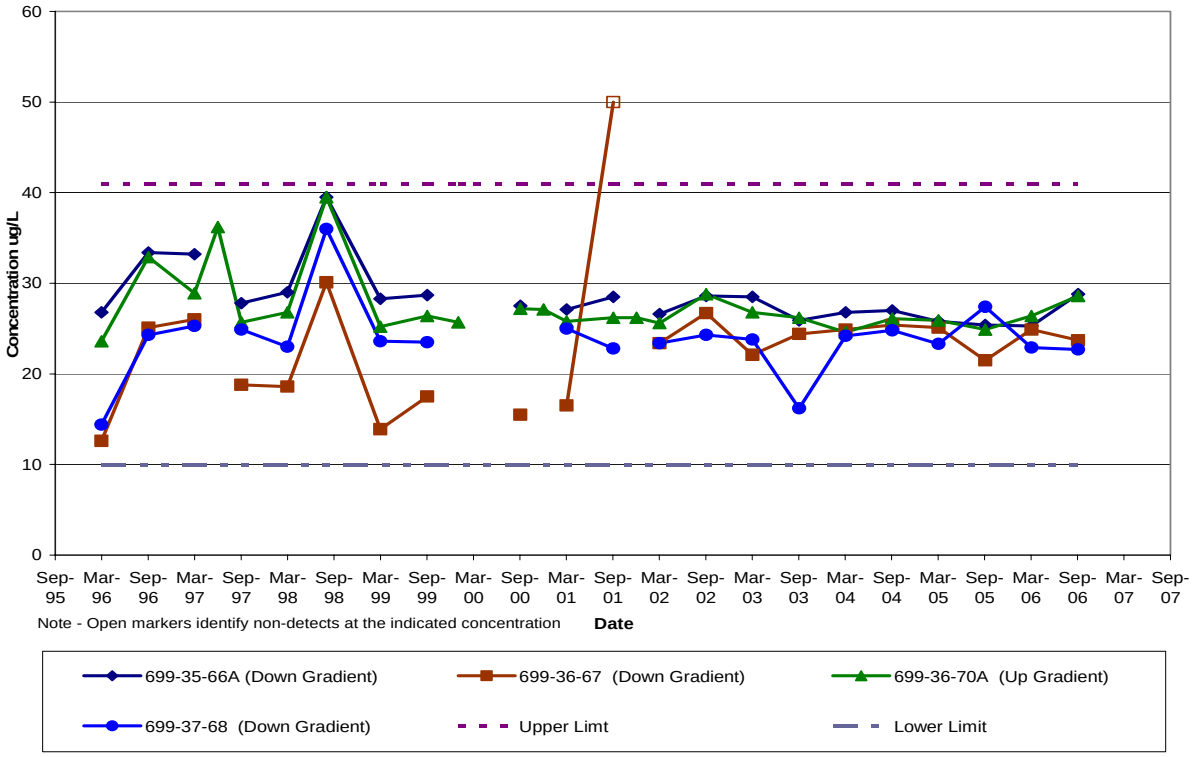


Figure B-9 Zinc (Filtered)

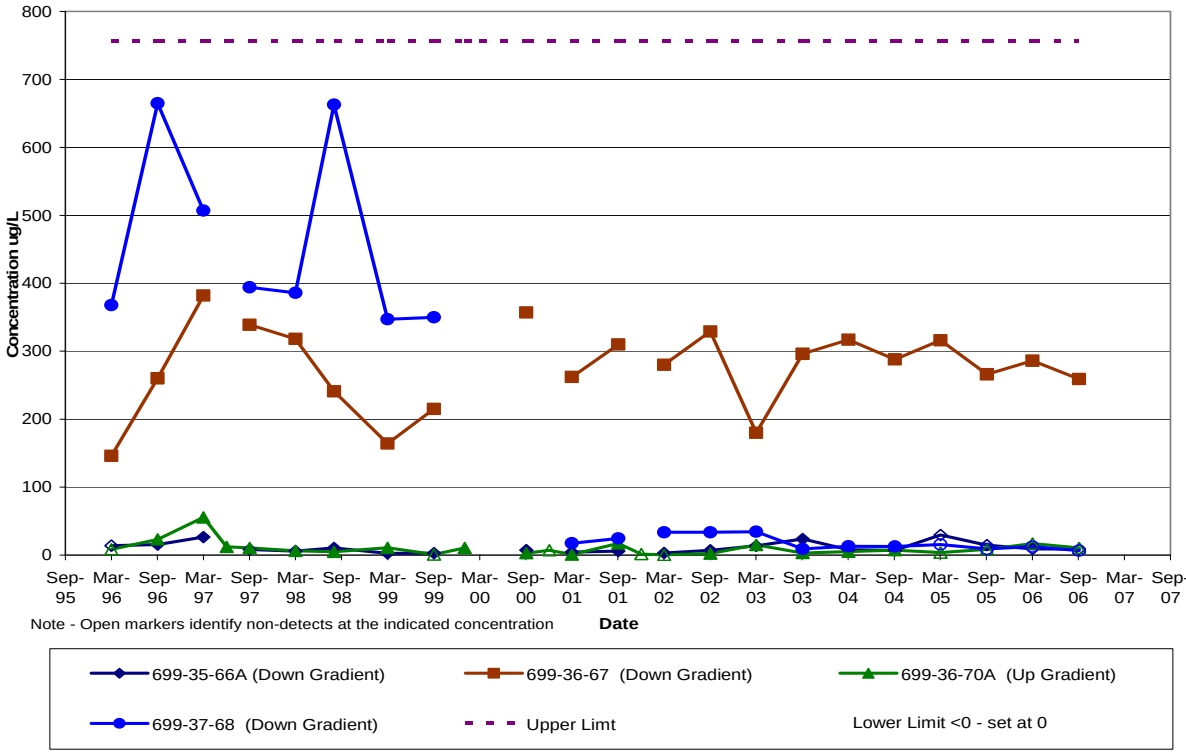
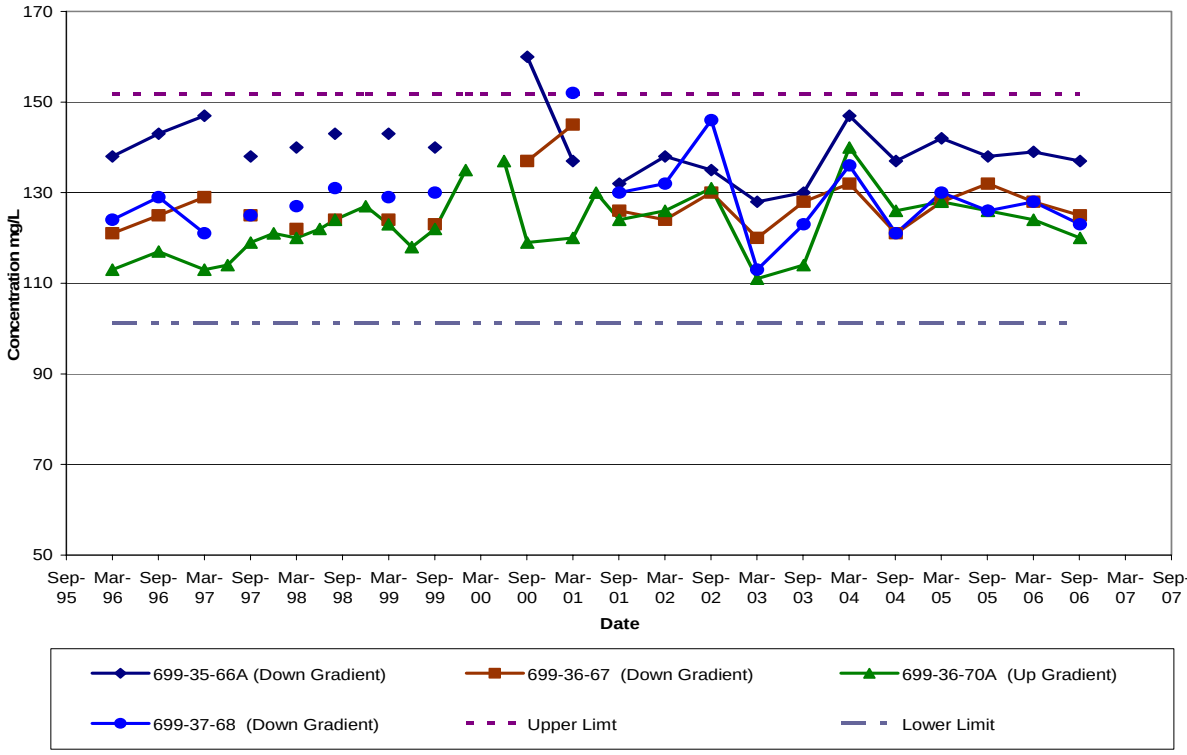


Figure B-10 Alkalinity



Appendix B – Groundwater Sampling Trends, 1996-2006

Figure B-11 Fluoride

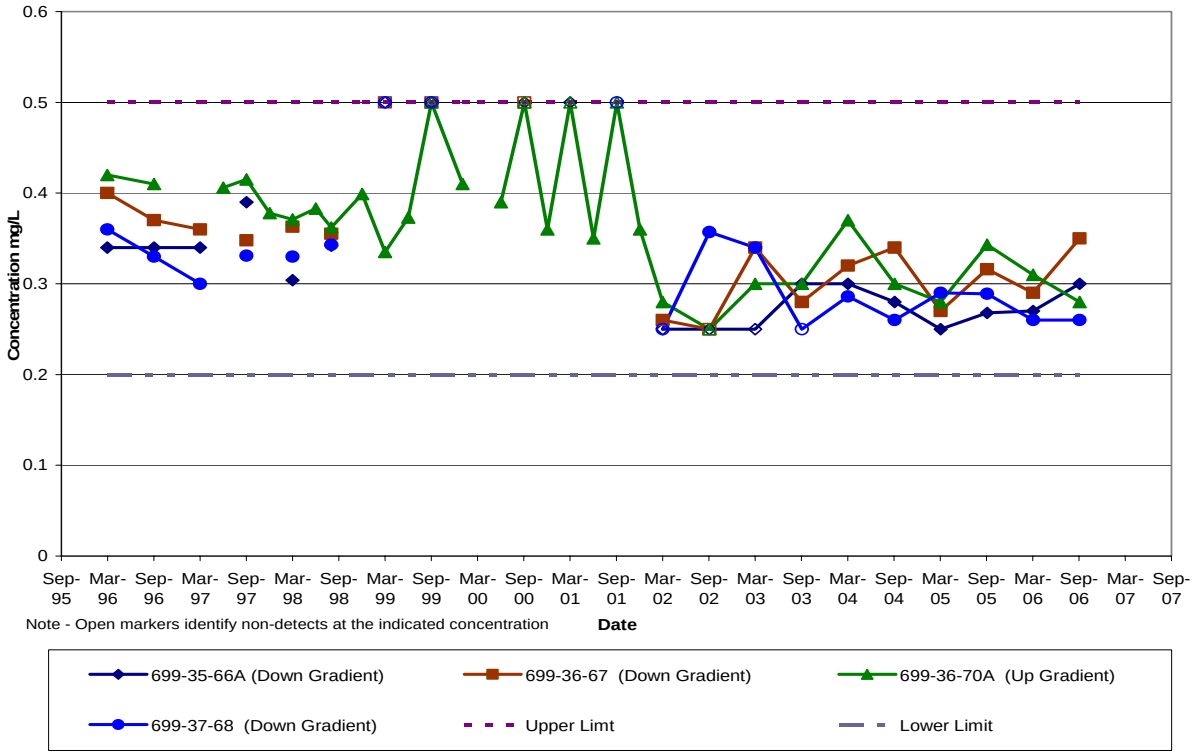


Figure B-12 Chloride

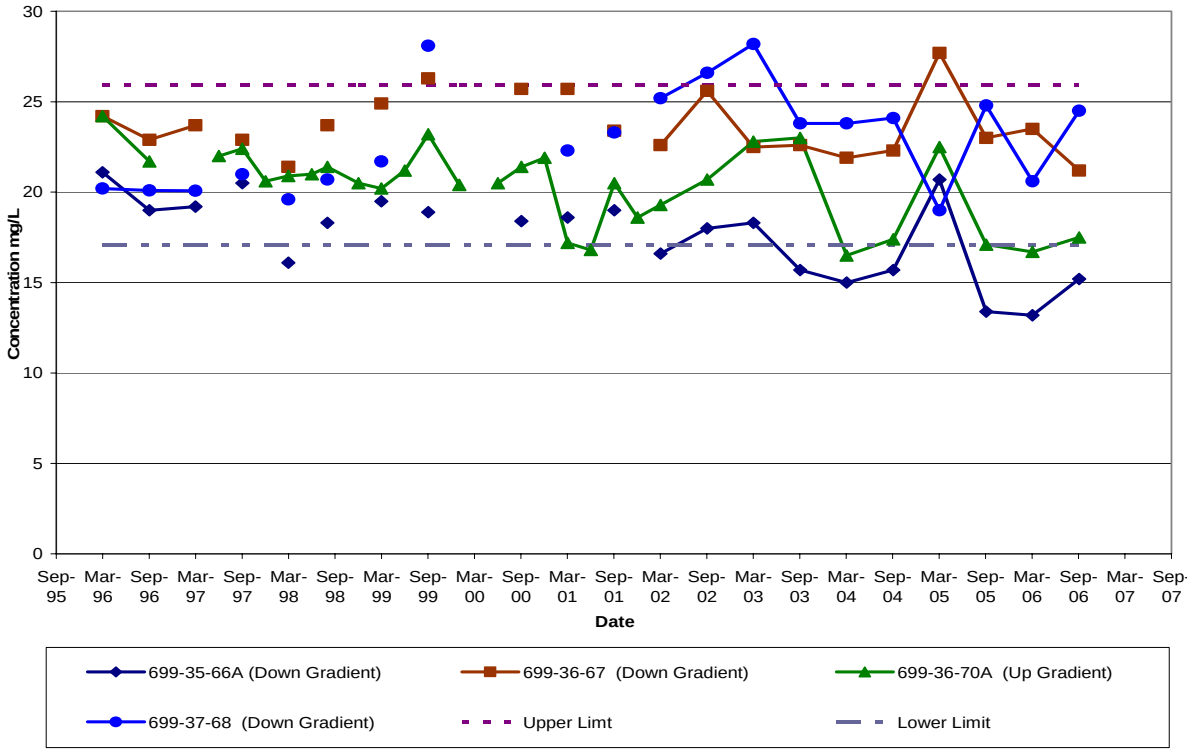


Figure B-13 Sulfate

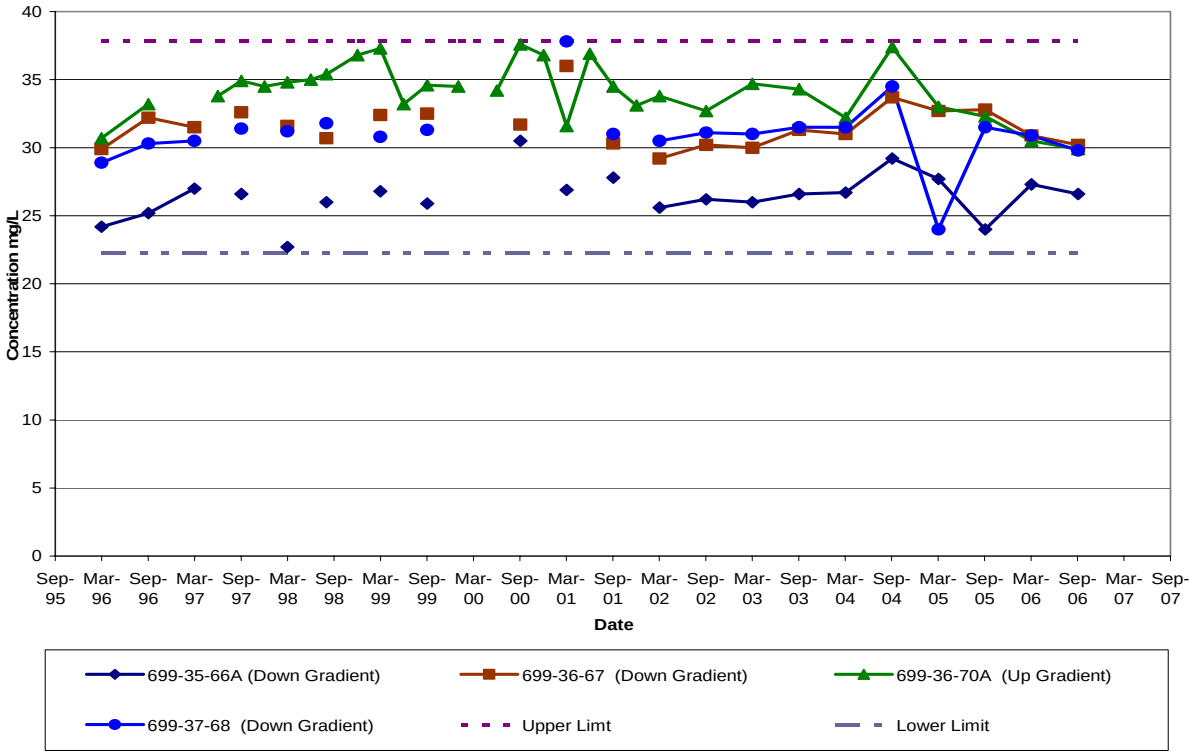


Figure B-14 Gross Alpha

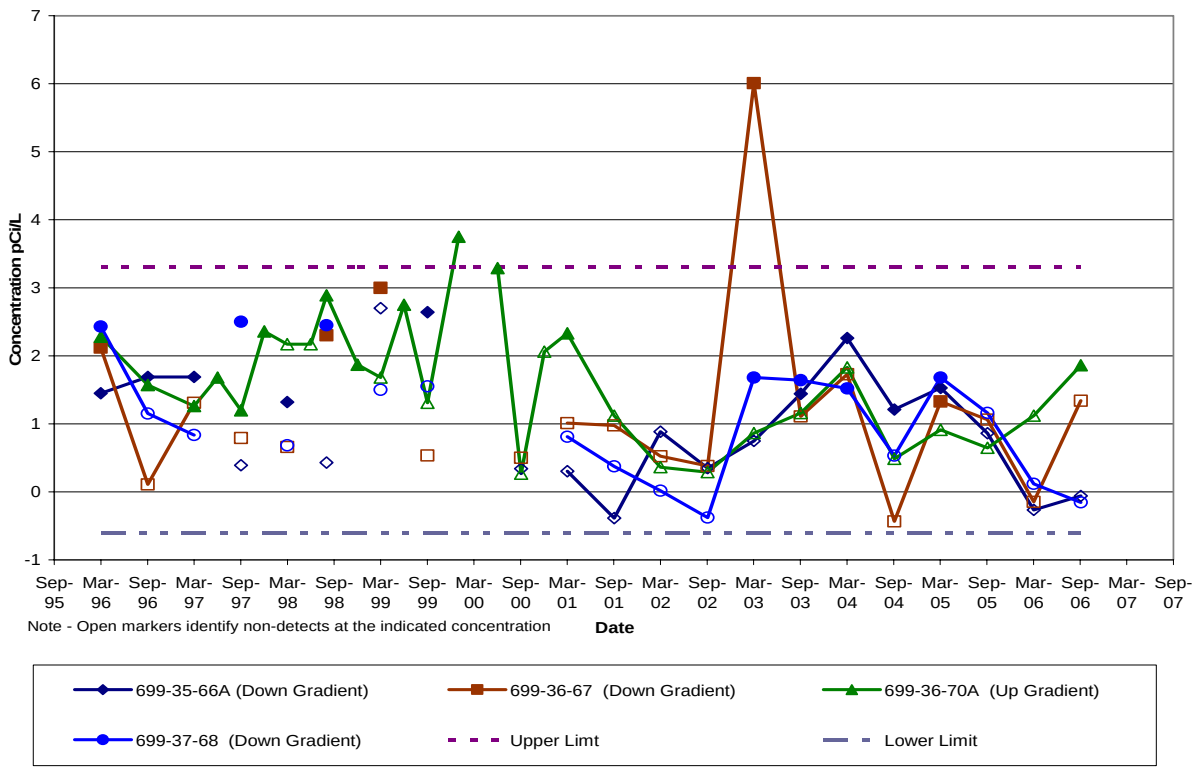


Figure B-15 Gross Beta

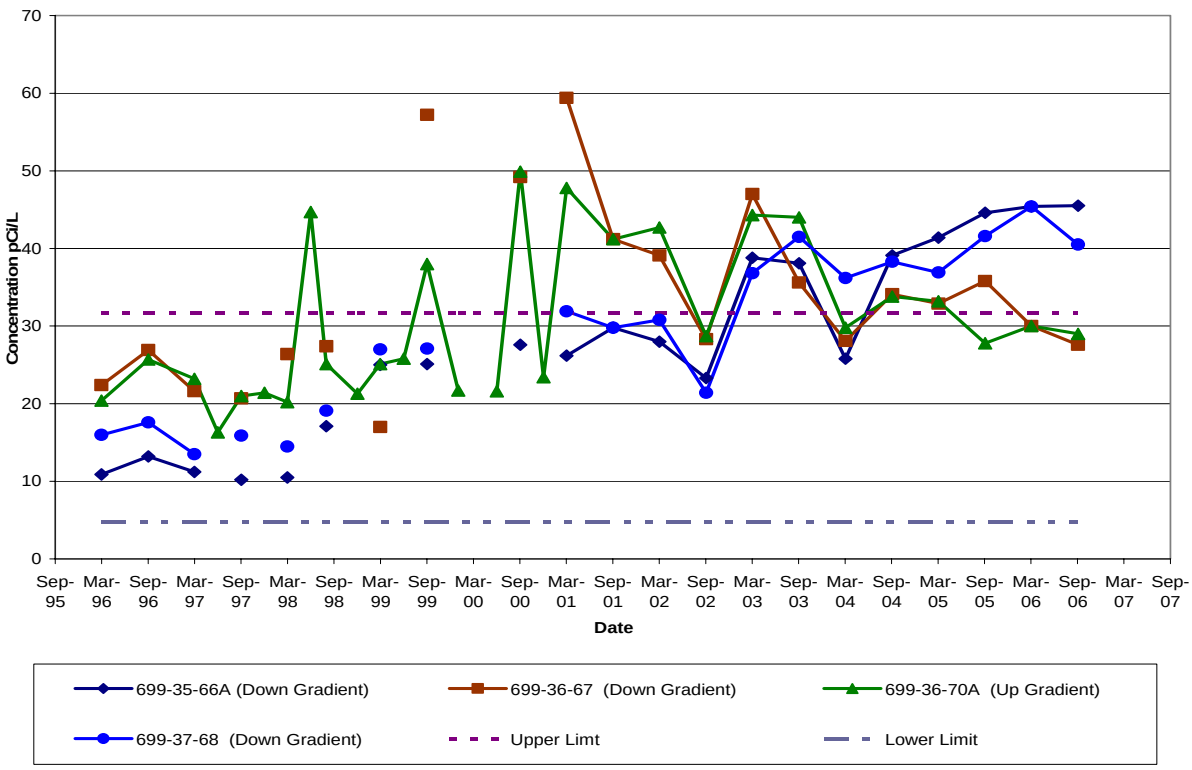


Figure B-16 Carbon-14

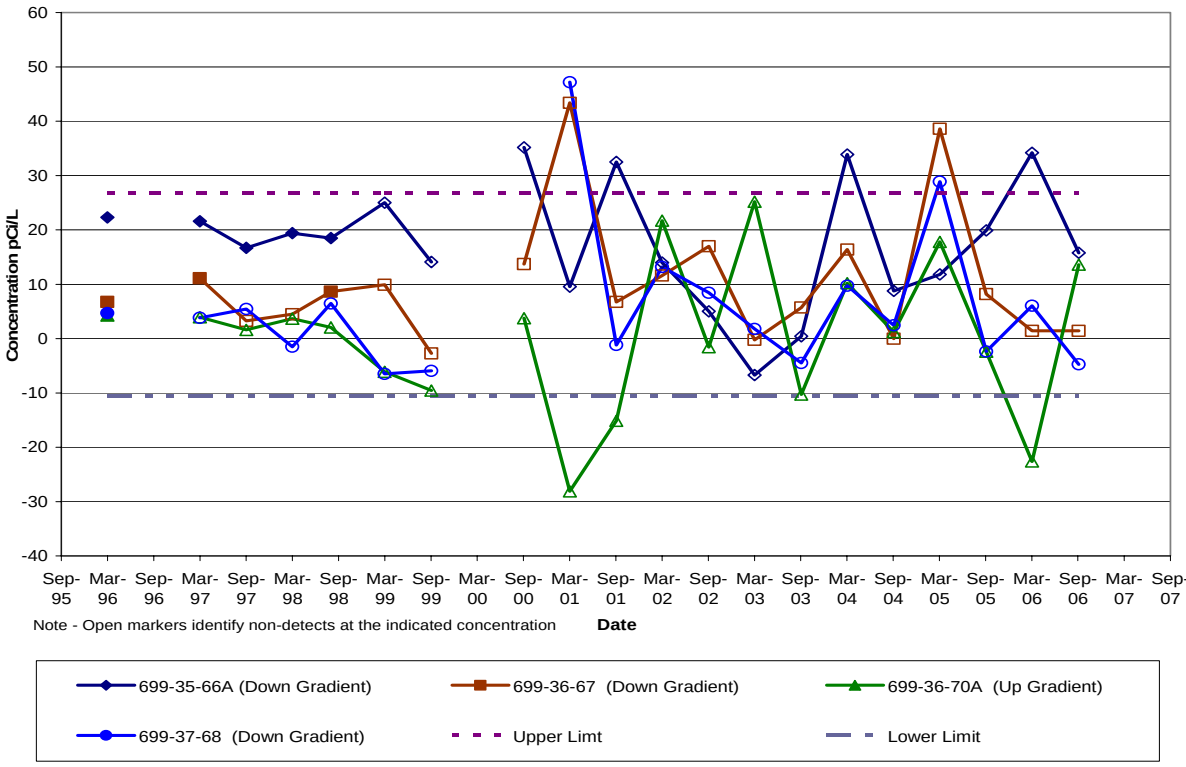


Figure B-17 Iodine-129

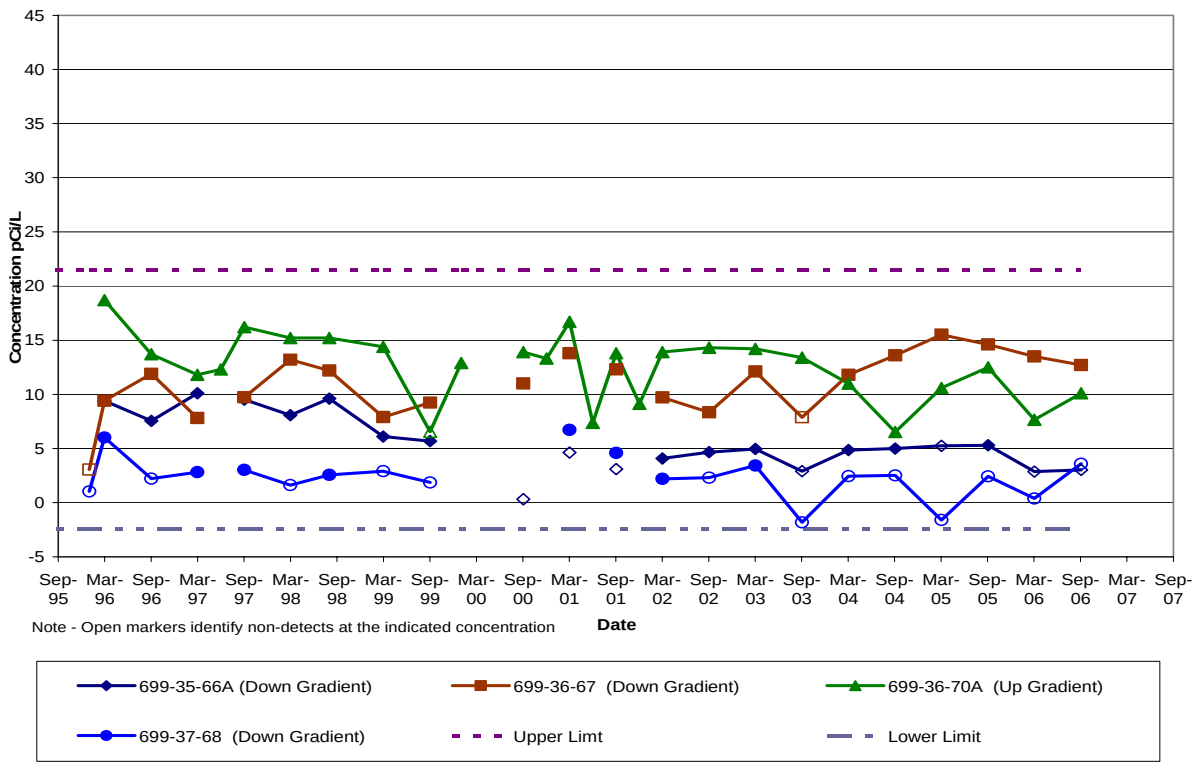


Figure B-18 Technetium-99

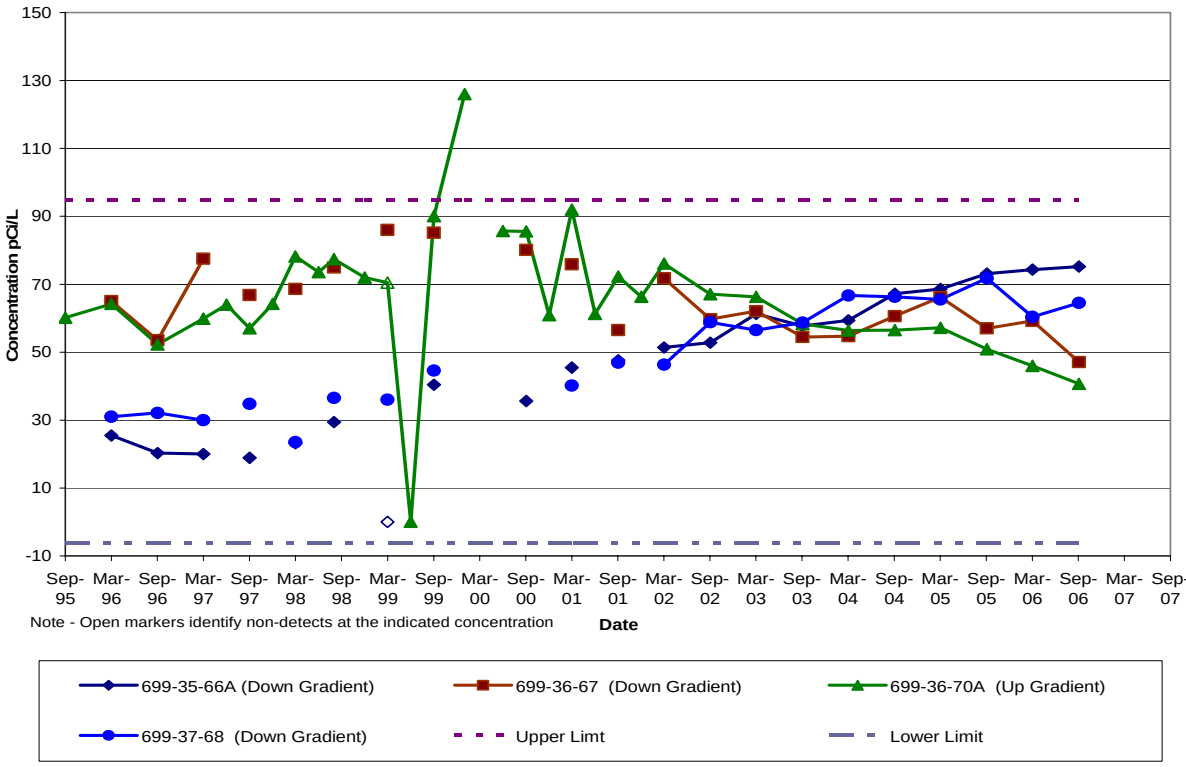


Figure B-19 Radium

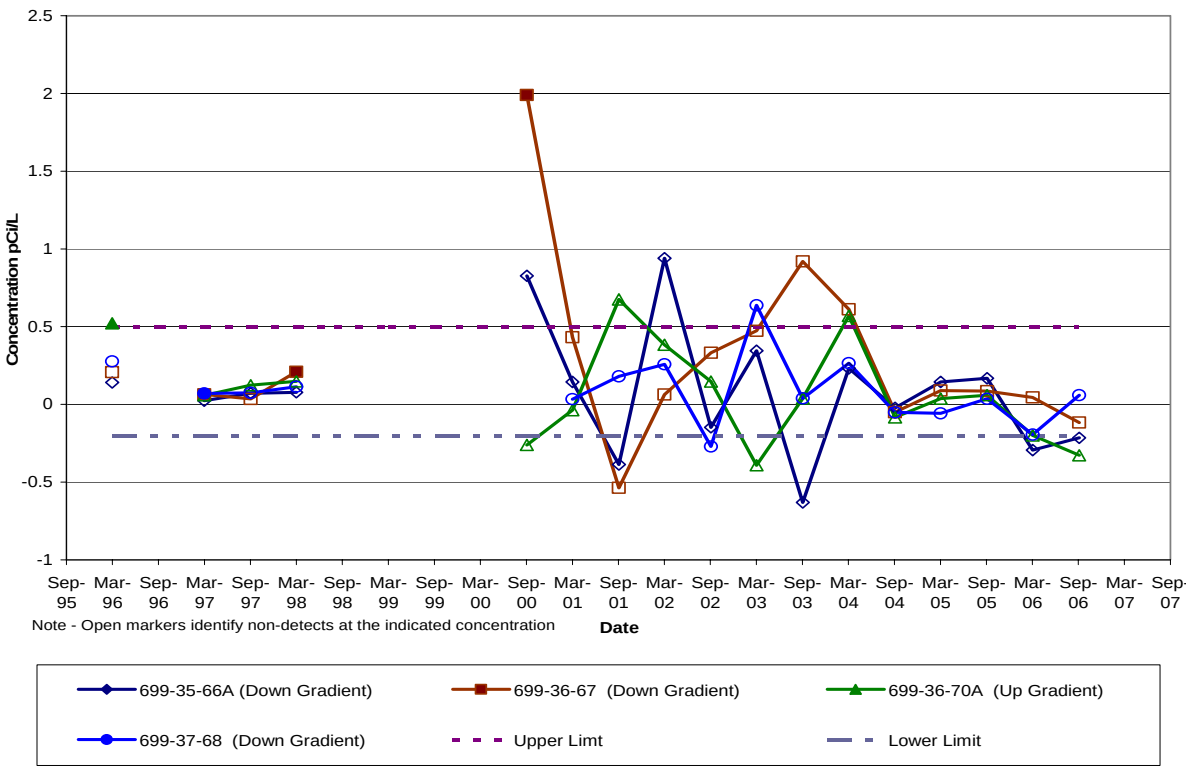


Figure B-20 Carbon Tetrachloride

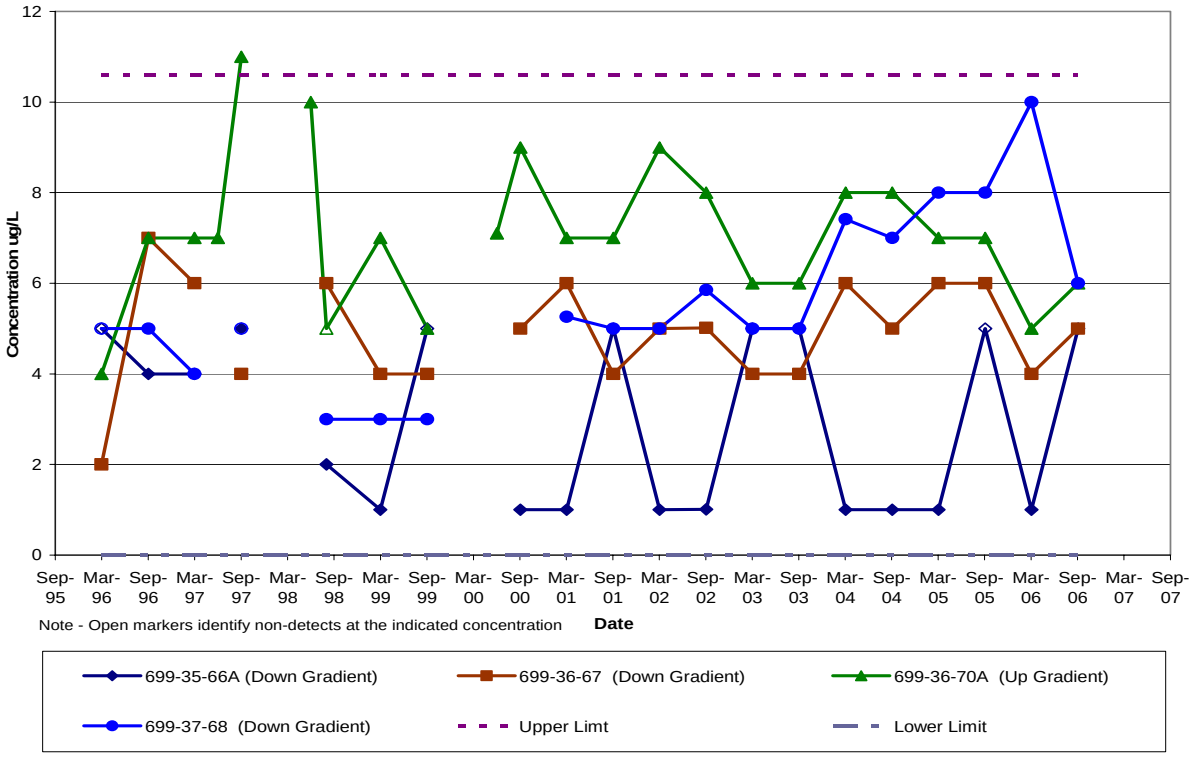


Figure B-21 Nitrogen in Nitrite and Nitrate

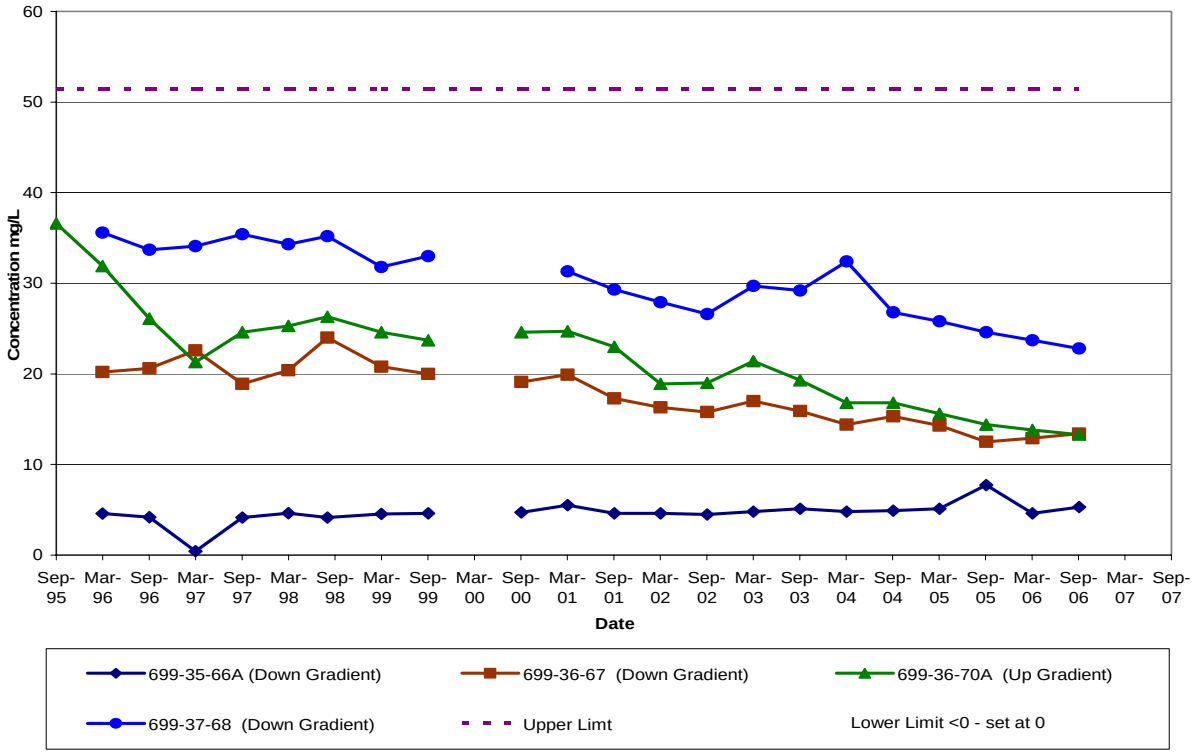


Figure B-22 Total Organic Halides

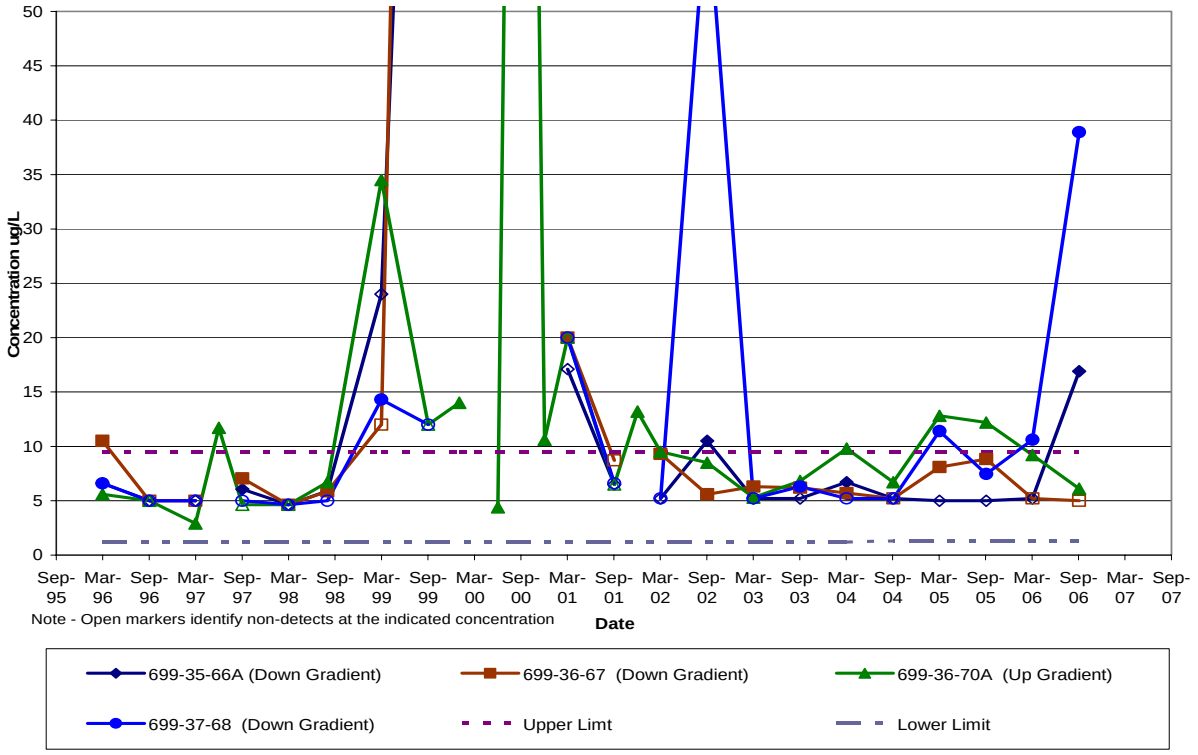


Figure B-23 Total Dissolved Solids

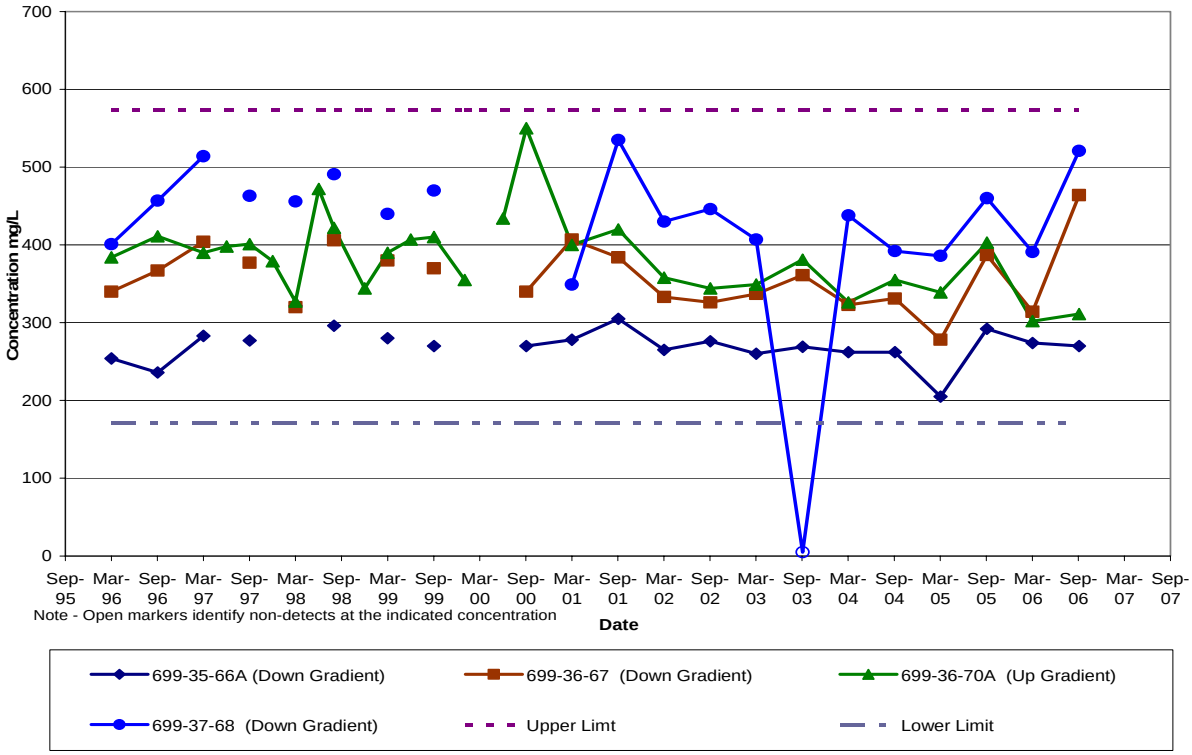


Figure B-24 Turbidity

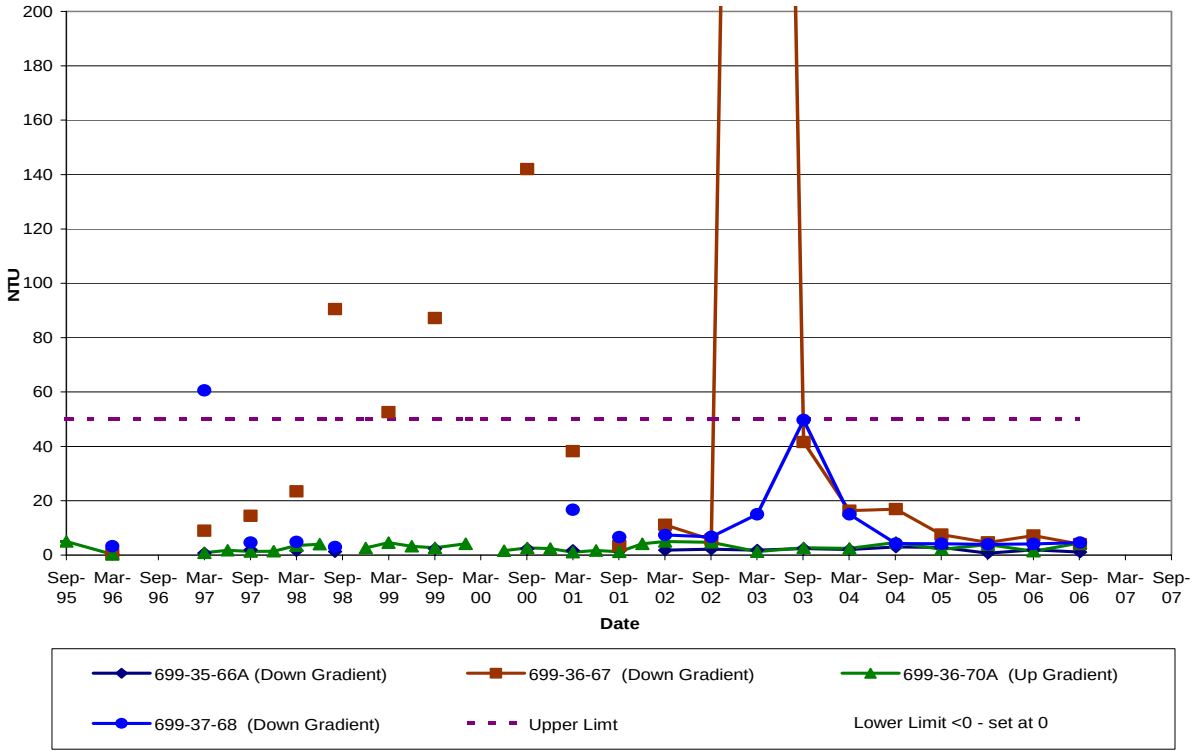


Figure B-25 pH

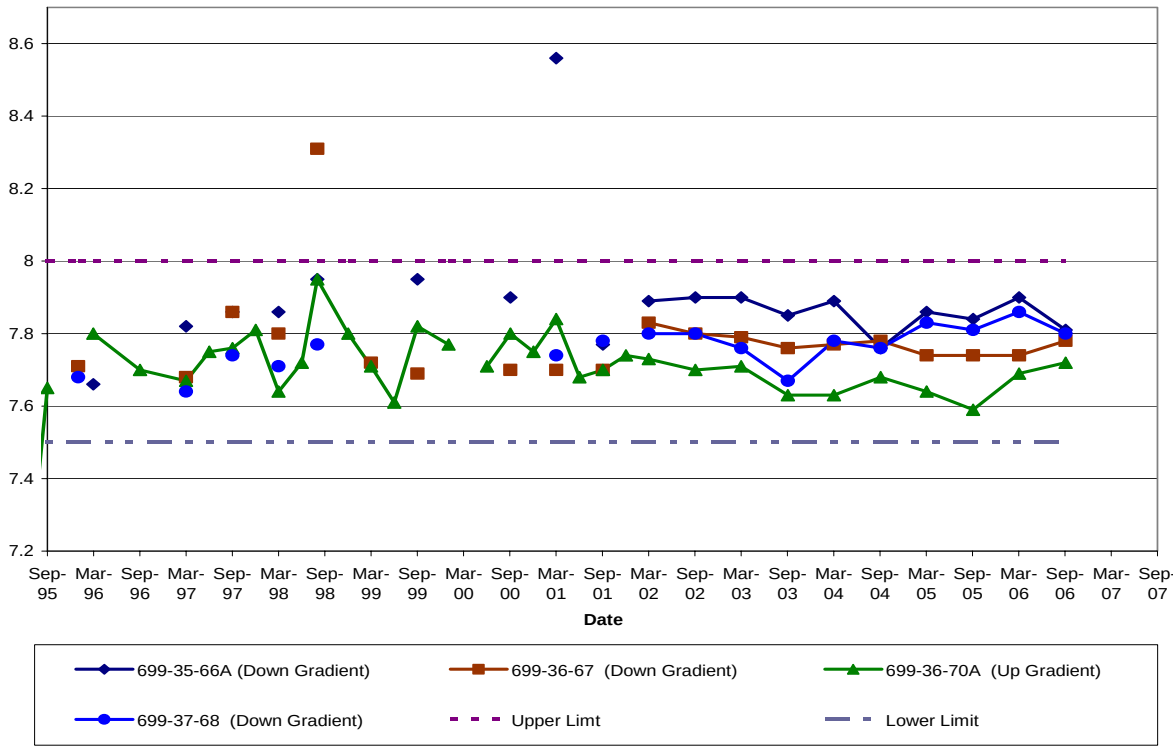
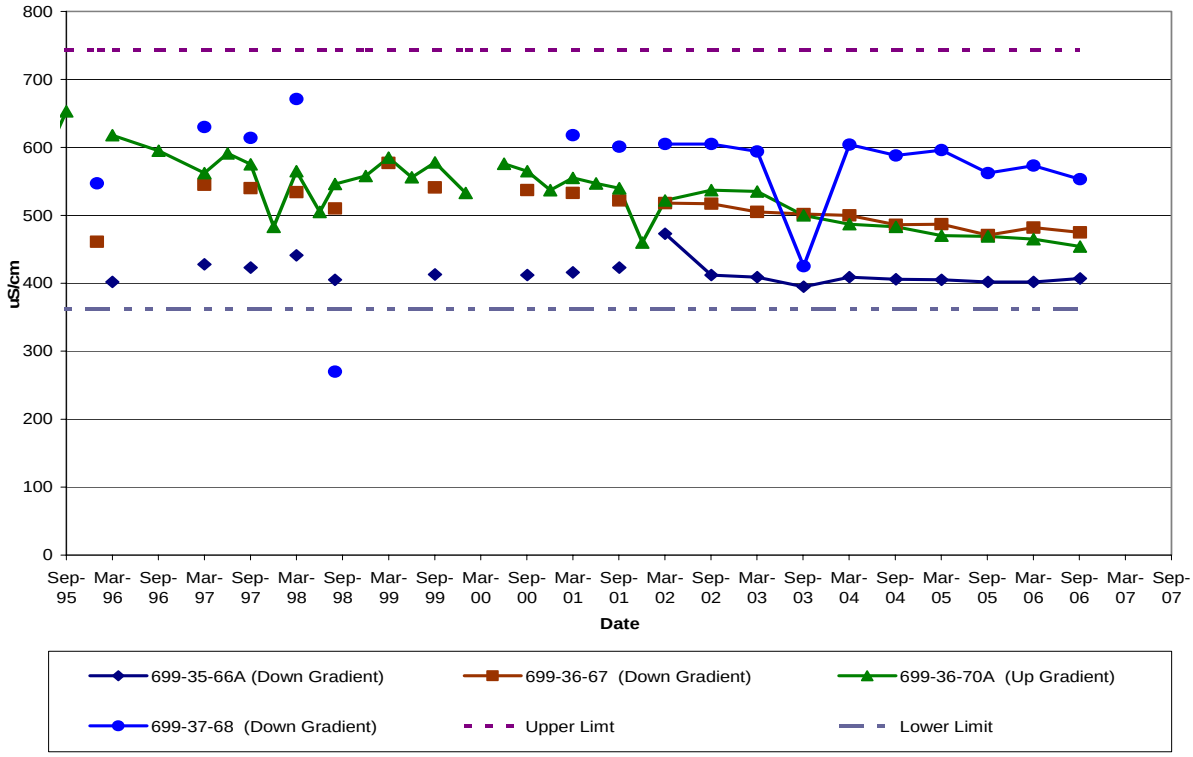


Figure B-26 Specific Conductance



APPENDIX C

LEACHATE SAMPLING SUMMARY, 2004-2006

Table C-1. Summary of Leachate Sampling Results, 2004-2006. (2 Pages)

Constituent	Jun-04	Jun-04	Dec-04	Dec-04	Jun-05	Jun-05	Dec-05	Dec-05	Jun-06	Jun-06	Dec-06	Dec-06	Units
Aluminum	NR	NR	32.2	44.7	NR	NR	NR	NR	NR	NR	54.4UJC	63.2UJC	ug/L
Antimony	NR	NR	2.8U	2.8	NR	NR	NR	NR	NR	NR	2.5U	2.5U	ug/L
Arsenic	7.7	7.1	8.4	9	30.5U	30.5U	7.2	8.3	6.6	9	7.3	6.6	ug/L
Barium	84	81.7	109	109	100	94.5	108	108	103	108	127C	127C	ug/L
Calcium	NR	NR	244000	246000	NR	NR	NR	NR	NR	NR	260000C	254000C	ug/L
Chromium	34.8	33.1	32.6	34.8	30.8	34.8	37.8	36.1	57.5	33.5	29.6	28.5	ug/L
Copper	NR	NR	10.3	9.3	NR	NR	NR	NR	NR	NR	9	9.1	ug/L
Iron	NR	NR	27.9U	27.9U	NR	NR	NR	NR	NR	NR	91.1	58.9	ug/L
Lead	3.1U	3.1U	2.2U	2.2U	32.7U	32.7U	3.1U	3.1U	3.1U	3.1U	1.6U	1.6U	ug/L
Magnesium	NR	NR	78300	78300	NR	NR	NR	NR	NR	NR	76100C	76600C	ug/L
Nickel	NR	NR	12.6	14.9	NR	NR	NR	NR	NR	NR	22.7	18.7	ug/L
Potassium	NR	NR	28100	27200	NR	NR	NR	NR	NR	NR	27000	27000	ug/L
Selenium	3.6	3.6	6.6	6.7	30.7U	30.7U	3.9	4.7	5.2	4.7U	6.4	4.5	ug/L
Silcon	NR	NR	21300	21600	NR	NR	NR	NR	NR	NR	20000C	19700C	ug/L
Sodium	NR	NR	253000	254000	NR	NR	NR	NR	NR	NR	267000C	257000C	ug/L
Tin	3.7U	3.7U	2.8U	2.8U	16U	16U	NR	5.2U	10.7U	10.7U	3.6U	3.6U	ug/L
Vanadium	19.7	19.9	20	19.6	24.5	24	18.7	18.1	18.9	18.4	16.9	17	ug/L
Zinc	4.9	4.7	7.6	4.9	19.8	15.4	16.6	11.7	9.1	10.3	5.7	6.7	ug/L
Carbon tetrachloride	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5UJ	5U	ug/L
Methyl alcohol	NR	NR	5000U	5000U	NR	NR	NR	NR	NR	NR	5000U	5000U	ug/L
Trichlorofluoromethane	NR	NR	5U	5U	NR	NR	NR	NR	NR	NR	5J	5	ug/L
pH	NR	NR	7.5	7.6	NR	NR	NR	NR	7.3	7.3	7.3	7.6	pH
Specific conductance	2250	2470	3480	3520	3120	2980	2770	2750	2710	2770	3650	3640	uS/cm
Bromide	780	690	1000	980	900	920	805	781	1100	1100	2500UD	2500UD	ug/L
Chloride	178000D	176000D	289000D	497000	288000D	242000D	211000D	221000D	175000D	186000D	224000D	224000D	ug/L
Fluoride	260	270	250U	280	260	250U	279	273	290	310	2500UD	2500UD	ug/L
Nitrate	309000D	294000D	449000D	536000	477000D	458000D	316000D	324000D	358000D	341000D	418000JD	373000JD	ug/L
Nitrite	1250UD	1250UD	250U	250U	2500UD	2500UD	5000UD	5000UD	2500UD	2500UD	2500UJD	2500UJD	ug/L
Sulfate	391000D	380000D	512000D	539000	632000D	507000D	431000D	404000D	408000D	412000D	573000D	563000D	ug/L
Total organic carbon	NR	NR	4100	10200	NR	NR	NR	NR	NR	NR	12000J	11900J	ug/L
Oil and grease	NR	NR	1100U	2200	NR	NR	NR	NR	NR	NR	1100UJ	1100UJ	ug/L

Table C-1. Summary of Leachate Sampling Results, 2004-2006. (2 Pages)

Constituent	Jun-04	Jun-04	Dec-04	Dec-04	Jun-05	Jun-05	Dec-05	Dec-05	Jun-06	Jun-06	Dec-06	Dec-06	Units
Total dissolved solids	1820000	1810000	2490000	2070000	2200000	2120000	1920000	1860000	2040000	2110000	2280000J	2360000J	ug/L
Total suspended solids			5000U	5000U	NR	NR	NR	NR	NR	NR	5000UJ	5000UJ	ug/L
Gross alpha	526	422	232	277	414	445	444	340	652	578	1310	1090	pCi/L
Gross beta	515	514	520	533	736	704	530	471	633	613	764	1100	pCi/L
Carbon-14	27.2U	29.2U	104	57.7U	75.8U	67.7U	12.8U	25.3U	33.4U	46.8U	118U	20.1U	pCi/L
Technetium-99	717	628	805	858	808	814	631	612	738	55.4	738	817	pCi/L
Uranium (Total)	756	751	953	933	1090	1030	941	754	930	932	1730	1740	ug/L
Iodine-129	-1.1U	-0.524U	0.288U	0.792U	-0.366U	0.41U	0.951U	0.844U	-1.2U	-2.61U	-0.375U	-0.481U	pCi/L
Total radium alpha emissions	-0.246U	-0.067U	0.193U	-0.044U	0.054U	0.06U	-0.02U	0.135U	-0.168U	0.022U	-0.316U	-0.046U	pCi/L

U = Result is nondetected.
D = Result reported from secondary dilution.
C = Analyte detected in associated laboratory batch blank.
J = Value is an estimate.
NR = Not requested for this analysis round.

Appendix C – Leachate Sampling Results Summary, 2004-2006

Table C-2. Leachate Long List Analytes. (2 Pages)

Constituent	Constituent	Constituent	Constituent
Aluminum	1,2-cis-Dichloroethene	2,4,6-Trichlorophenol	Nitrobenzene
Antimony	1,2-Dichloroethane	2,4-Dichlorophenol	N-Nitroso-di-n-propylamine
Arsenic	1,2-Dichloropropane	2,4-Dimethylphenol	N-Nitrosodiphenylamine
Barium	1,2-trans-Dichloroethene	2,4-Dinitrophenol	N-Nitrosomorpholine
Beryllium	1,3-Butadiene	2,5-Diamintoluene	N-Nitroso-N,N-dimethylamine
Cadmium	cis-1,3-Dichloropropene	2-Chloronaphthalene	O,O,O-Triethyl phosphorothioate
Calcium	trans-1,3-Dichloropropene	2-Chlorophenol	Pentachlorophenol
Chromium	1,4-Dioxane	2-Cyclohexyl-4,6-dinitrophenol	Phenol
Cobalt	1-Chloroethene (Vinyl Chloride)	2-Naphthylamine	p-Phenylenediamine
Copper	(1-Methylethyl)benzene	4-Bromophenylphenyl ether	Pyrene
Lead	2-Butanone (MEK)	4-Chloro-3-methylphenol	Pyridine
Magnesium	2-Butenaldehyde (Crotonaldehyde)	4-Nitrophenol	Tetrahydrofuran
Manganese	2-Chloroethyl vinyl ether	7,12-Dimethylbenz[a]anthracene	Formaldehyde
Nickel	2-Methyl-2-propenenitrile (Methacrylonitrile)	Acenaphthene	Bendiocarb
Potassium	2-Methylpropyl alcohol (Isobutyl alcohol)	Acetophenone	Cyanide
Selenium	2-Propanone (Acetone)	alpha-Naphthylamine	Sulfide
Silcon	2-Propen-1-ol (Allyl alcohol)	Aniline	pH
Silver	3-Chloropropene (Allyl chloride)	Anthracene	Specific Conductance
Sodium	4-Methyl-2-pentanone (MIBK)	Benzo(a)anthracene	Bromide
Thallium	Acetic acid ethyl ester (Ethyl acetate)	Benzo(a)pyrene	Chloride
Tin	Acetic acid vinyl ester (Vinyl acetate)	Benzo(b)fluoranthene	Fluoride
Vanadium	Acetonitrile	Benzo(k)fluoranthene	Nitrate
Zinc	Acrolein	Benzyl alcohol	Nitrite
Mercury	Acrylonitrile	Bis(2-Chloroethoxy)methane	Phosphate
4,4-DDD	Benzene	Bis(2-chloroethyl) ether	Sulfate
4,4-DDE	Bromodichloromethane	Bis(2-Chloroisopropyl) ether	Ammonia
4,4-DDT	Bromomethane	Bis(2-ethylhexyl) phthalate	Total Organic Carbon
Aldrin	Carbon disulfide	Butylbenzylphthalate	Oil & Grease
alpha-BHC	Carbon tetrachloride	Chrysene	Total Dissolved Solids
beta-BHC	Chlorobenzene	o-Cresol	Total Suspended Solids
Dieldrin	Chloroethane	m-Cresol	Gross alpha
Endrin	Chloroform	p-Cresol	Gross beta
Gamma-BHC (lindane)	Chloromethane	Dibenz[a,h]anthracene	Carbon-14
Heptachlor	Dibromochloromethane	1,2-Dichlorobenzene	Technetium-99
Heptachlor Epoxide	Dichlorodifluoromethane	1,3-Dichlorobenzene	Uranium (Total)

Appendix C – Leachate Sampling Results Summary, 2004-2006

Table C-2. Leachate Long List Analytes. (2 Pages)

Constituent	Constituent	Constituent	Constituent
Toxaphene	Dichloromethane (Methylene Chloride)	1,4-Dichlorobenzene	Potassium-40
PCB-1016	Dichloropropanol	Diethyl phthalate	Cobalt-60
PCB-1221	Ethyl benzene	Dimethyl phthalate	Cesium-137
PCB-1232	Ethyl ether	Di-n-butylphthalate	Europium-152
PCB-1242	Ethylene dibromide	1,3-Dinitrobenzene	Europium-154
PCB-1248	Methyl alcohol	1,4-Dinitrobenzene	Europium-155
PCB-1254	n-Butyl alcohol	Di-n-octylphthalate	Radium-226
PCB-1260	Styrene	Ethyl methanesulfonate	Radium-228
2,4-D	Toluene	Fluoranthene	Thorium-228
1,1,1-Trichloroethane	Tribromomethane (Bromoform)	Fluorene	Thorium-232
1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Hexachlorobutadiene	Uranium-235
1,1,2,2-Tetrachloroethene	Trichloromethanetiol	Hexachloroethane	Uranium-238
1,1,2-Trichloroethane	Xylene	Hexachlorophene	Americium-241
1,1,2-Trichloroethylene	1,2,4-Trichlorobenzene	Indeno(1,2,3-cd)pyrene	Iodine-129
1,1-Dichloroethane	1,2-Diphenylhydrazine	Isophorone	Total radium alpha emissions
1,1-Dichloroethene	1-Acetyl-2-thiourea	N,N-Diphenylamine	
1,2,2-Trichlorotrifluoroethane	2,4,5-Trichlorophenol	Naphthalene	

DISTRIBUTION

Washington Closure Hanford

M A. Casbon	T2-03
K. A. Hadley	T2-04
W. E. Remson	T2-03
J. E. Rugg	T2-04

Document Control	H4-11
DOE-RL Public Reading Room	H2-53
Hanford Technical Library	P8-55